

*A webcomic of romance, sarcasm,
math, and language*

xkcd

RANDALL MUNROE

2009

xkcd

2009

a collection of 158 webcomics

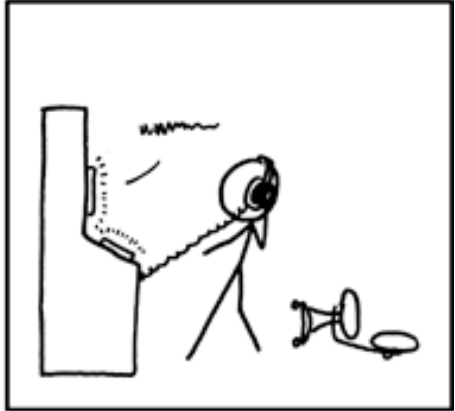
from #525 to #682

by Randall Munroe

#525: I Know You're Listening

January 02, 2009

NOW AND THEN, I ANNOUNCE "I KNOW
YOU'RE LISTENING" TO EMPTY ROOMS.



IF I'M WRONG, NO ONE KNOWS.
AND IF I'M RIGHT, MAYBE I JUST FREAKED
THE HELL OUT OF SOME SECRET ORGANIZATION.

It's basically Pascal's Wager for the paranoid prankster.

Explanation

Cueball occasionally says "I know you're listening" aloud in empty rooms. The idea is that, with nobody listening, he doesn't lose anything; if somebody is listening, however, he gains by freaking them out, which might cause them to reveal themselves and/or cease their activities. In this case, another Cueball-like surveillance man does get quite the shock.

As mentioned in the title text, this is similar to Pascal's Wager. Blaise Pascal was a French philosopher and mathematician who discussed the issue of the possibility that God actually does exist or not. According to Pascal, a rational person should live as though (a Christian) God exists, because he would lose negligible things if this turns out not to be true, but would gain immensely if it is true, by going to heaven in the afterlife. As Pascal himself recognized, this is not a proof of any god's existence, Christian or otherwise, but rather an inexorable choice made by every human being. Cueball makes a similar choice here, though hardly for such a moral reason.

#526: Converting to Metric

January 05, 2009

GUIDE TO CONVERTING TO METRIC

TEMPERATURE	
60°C	EARTH'S HOTTEST
45°C	DUBAI HEAT WAVE
40°C	SOUTHERN US HEAT WAVE
35°C	NORTHERN US HEAT WAVE
30°C	BEACH WEATHER
25°C	WARM ROOM
20°C	ROOM TEMPERATURE
10°C	JACKET WEATHER
0°C	SNOW!
-5°C	COLD DAY (BOSTON)
-10°C	COLD DAY (MOSCOW)
-20°C	FUCKFUCKFUCKCOLD
-30°C	FUUUUUUUUUCK!
-40°C	SPIT GOES "CLUNK"



THE KEY TO CONVERTING TO METRIC IS ESTABLISHING NEW REFERENCE POINTS. WHEN YOU HEAR "26°C," INSTEAD OF THINKING "THAT'S 79°F" YOU SHOULD THINK, "THAT'S WARMER THAN A HOUSE BUT COOL FOR SWIMMING." HERE ARE SOME HELPFUL TABLES OF REFERENCE POINTS:

LENGTH	
1 cm	WIDTH OF MICROSD CARD
3 cm	LENGTH OF SD CARD
12 cm	CD DIAMETER
14 cm	PENIS
15 cm	BIC PEN
80 cm	DOORWAY WIDTH
1 m	LIGHTSABER BLADE
170 cm	SUMMER GLAU
200 cm	DARTH VADER
2.5m	CEILING
5m	CAR-LENGTH
16 m 4m	HUMAN TOWER OF SERENITY CREW



SPEED	
kph	m/s
5	1.5 WALKING
13	3.5 JOGGING
25	7 SPRINTING
35	10 FASTEST HUMAN
45	13 HOUSECAT
55	15 RABBIT
75	20 RAPID
100	25 SLOW HIGHWAY
110	30 INTERSTATE (65 MPH)
120	35 SPEED YOU ACTUALLY GO WHEN IT SAYS "65"
140	40 RAPTOR ON HOVERBOARD

VOLUME	
3 mL	BLOOD IN A FIELD MOUSE
5 mL	TEASPOON
30 mL	NASAL PASSAGES
40 mL	SHOT GLASS
350 mL	SODA CAN
500 mL	WATER BOTTLE
3 L	TWO-LITER BOTTLE
5 L	BLOOD IN HUMAN MALE
30 L	MILK CRATE
55 L	SUMMER GLAU
65 L	DENNIS KUCINICH
75 L	RON PAUL
200 L	FRIDGE



SO, WHEN IT'S BLOCKED, THE MUCUS IN YOUR NOSE COULD ABOUT FILL A SHOT GLASS.

RELATED: I'VE INVENTED THE WORST MIXED DRINK EVER.



MASS	
3g	PEANUT M&M
100g	CELL PHONE
500g	BOTTLED WATER
1 kg	ULTRAPORTABLE LAPTOP
2 kg	LIGHT-MEDIUM LAPTOP
3 kg	HEAVY LAPTOP
5 kg	LCD MONITOR
15 kg	CRT MONITOR
4 kg	CAT
4.1 kg	CAT (WITH CAPTION)
60 kg	LADY
70 kg	DUDE
150 kg	SHAG
200 kg	YOUR MOM
220 kg	YOUR MOM (INCL. CHEAP JEWELRY)
223 kg	YOUR MOM (ALSO INCL. MAKEUP)



According to River, 'adequate' vacuuming systems drain the human body at about half a liter per second.

Explanation

Most people will eventually develop an intuitive feel for how big certain measurements are (e.g., how long an inch or a foot is, how much a pound weighs). This comic points out that people who were brought up using the United States system of customary units probably don't have the same intuitive understanding for metric units and attempts to provide some benchmarks for these people. Most of the benchmarks are common sense, highly-useful ones (e.g., if it's 30 degrees Celsius, you'd be quite comfortable outside dressed for the beach) but some of the benchmarks are humorous and/or completely useless as can be seen below.

Some people argue for switching to metric units in the US, and these people became part of the comic 1982: Evangelism.

In the book Thing Explainer a similar chart for metrics is shown in the explanation for How to count things, with four of the five measures from this comic also explained in simple language. Only volume is left out there. Only thing used in both explanations is the weight of a cat, but in the book it weighs 5 kg rather than 4 kg in this comic.

Temperature[edit]

- 60 °C - Earth's hottest: The hottest temperature recorded on earth is actually "only" 56.7 °C. There have been reports of temperatures ten-twenty degrees higher (70–80 °C) but these measurements are not verified or accepted as world records.

- 45 °C, 40 °C, 35 °C: Various heat waves. Dubai is a city in the United Arab Emirates, and is smack-dab in the middle of an equatorial desert, so their heat waves can get hot!. The southern United States will typically be a few degrees hotter than the northern United States simply because it's closer to the equator, but as mentioned they're both above "Beach Weather".
- 30 °C: A little too hot so perfect for a trip to the beach.
- 25 °C: Would as mentioned be too warm for room temperature...
- 20 °C: Defined as room temperature in many experimental settings. For some this would feel a little cool.
- 10 °C: Definitely wear a jacket. Especially if there is just a little breeze.
- 0 °C: The freezing point of water.
- -5 °C, -10 °C: In Moscow -10 °C is not really that cold - it can go "spit goes clink" cold in Moscow, whereas -5 °C in Boston may be very cold.
- -20 °C - FuckFuckFuckCold,
- -30 °C - Fuuuuuuuuuuck!: This is implied to be basically what some people would say when they step outside at this temperature. In reality, it would be best to keep one's mouth firmly closed. At -30 °C, without taking wind chill into account, exposed skin will feel painful in under a minute and frostbite could begin in as little as ten minutes. The differing statements seem to imply that at -20 °C, the user would be saying "fuck" repeatedly, whereas at -30 °C, the user is incapable of closing their mouth after starting the first "fuck", and so extends it into one long one.

- -40°C - Spit goes "clink": As shown in the drawing your spit would freeze before it hits the ground. This is the agreement point of the two temperature scales i.e. $-40^{\circ}\text{C} = -40^{\circ}\text{F}$.

See also 1643: Degrees about not being able to choose between the two temperature scales and 1923: Felsius about a compromise between the two scales. In the comic 1982: Evangelism, some people are stated to argue for the US to convert to the metric system, except for the Fahrenheit scale which they wish to keep.

Length[edit]

- 1 cm - Width of microSD card, 3 cm - Length of SD card: Refers to the memory cards used in cell phones, digital cameras, etc.
- 12 cm: CD-ROM is a common object so nice to know it is a dozen centimeters.
- 14 cm: Most males would probably exaggerate the size of their penis, but 14–15 cm is very average.
- 15 cm: A Bic pen.
- 80 cm: A typical doorway width is also of standard size. This is barely over the minimum size typically required by codes for buildings (30 inches or 76.2 cm in the US), but more than 50% over the size required for aircraft emergency exits. (It may seem illogical that larger doors are required in buildings than in airplanes, given airplanes are arguably more dangerous. However, there is no real disadvantage to using larger doors in buildings, which are not significantly pressurized, but using larger doors in aircraft would increase the force on the door caused by cabin pressure proportionally.)
- 1 m - Lightsaber blade: Refers to the weapon used in the Star Wars movie franchise. Canonically, the length of a lightsaber's

blade varies greatly depending on the setting of the weapon, but "one meter" is by no means a bad approximation.

- 170 cm - Summer Glau: Refers to the height of the actress who portrays the character River Tam on the TV show Firefly.
- 200 cm - Darth Vader: Refers to the height of the main antagonist from Star Wars.
- 2.5 m: A ceiling - of course very much depending on which type of building you are in!
- 5 m: A car length - also very much depending on the car...
- 16 m 4 cm - Human tower of Serenity crew: Again, this refers to the Firefly TV show, which takes place mostly on a space ship called Serenity.

Presumably, if all the crew of Serenity were stacked on top of each other, this would be their combined height.

The comic depicts four characters from the show standing on top of each other; the bottom figure is the crew's captain, Malcolm Reynolds in his signature coat. Judging from the other drawing of Summer Glau from the volume section, she is standing on top of the captain.

The other five members of the crew should also be stacked on top of these four to reach the 16.04 m height - giving them an average height of 1.78 m (8 cm more than Summer Glau's height!)

Speed[edit]

- 5 kph - 1.5 m/s: Walking at a normal pace.
- 13–25 kph - 3.5–7 m/s: Jogging to sprinting.
- 35 kph - 10 m/s - Fastest human: As of 2009, the fastest a

human has been recorded to run in a single sprint is actually 12.4 m/s or 44.7 km/h, a record set by Usain Bolt.

- 45–55 kph - 13–15 m/s: Both cats and rabbits go much faster than normal people.
- 75 kph - 20 m/s - Raptor: It's a comic written by Randall; of course a reference to the velociraptors from Jurassic Park was going to be here.
- 100 kph - 25 m/s: A slow highway. (25 m/s actually exactly equals 90 km/h.)
- 110 kph - 30 m/s - Interstate (65 mph): Refers to the American highway system. (65 mph would actually be only 104.6 km/h.)
- 120 kph - 35 m/s - Speed you actually go when it says "65": People routinely break the aforementioned speed limit, and the police typically don't mind as long as it's not posing any danger.
- 140 kph - 40 m/s - Raptor on hoverboard: The hoverboard and its speed (~88 mph) is probably a reference to the Back to the Future Part II, though hoverboards are a fairly common trope in older science fiction stories. Randall obviously did a lot of google searching on this subject the week before - see 522: Google Trends.

Volume[edit]

- 3 mL: The amount of blood in a fieldmouse. A similar amount is used in comic 434: xkcd Goes to the Airport.
- 5 mL: A teaspoon - a very common measure.
- 30 mL - Nasal passages, 40 mL - Shot glass: The comic points out that you could just about fill a shot glass using the mucus from your nose. Since shot glasses are usually used for mixed drinks, the comic jokes that this mucus could constitute a new,

disgusting drink - and this is depicted in the drawing. Much later, in 2673: Cursed mRNA Cocktail, a similar disgusting drink is suggested to be served in shot glasses. Actually specifically in relation to trying not to get blocked nasal passages as it is in relation to the COVID-19 vaccine.

- 350 mL: Soda can (this is roughly correct for the cans used in the U.S., which hold 12 fluid ounces or 355 mL; in Europe, soda cans commonly hold 330 mL or 500 mL).
- 500 mL: Water bottle (this is also the volume of a European water bottle).
- 3 L - Two-liter bottle: Refers to a bottle which contains 2 L (in the US usually soda). There is debate as to the reason for the discrepancy in volume. It may be a reference to stereotypical Americans consuming a lot of high-calorie foods and drinks. The simpler explanation would be that it is a joke. The two-liter bottle is named using its volume. Labeling it with a volume of three liters is the joke.
- 5 L: An adult male has about 5 L of blood in his body (An adequate vacuuming system could drain this blood out in 10 s - as per the title text!)
- 30 L - Milk crate: Refers to a type of small box originally used to transport milk but now often in demand to be used as a bicycle basket, storage spaces, etc.
- 55 L - Summer Glau: Again, this refers to the actress from Firefly.
- 65 L - Dennis Kucinich: An American politician belonging to the Democratic party, noted for his relatively strong (for the US) leftist views.
- 75 L - Ron Paul: An American politician, member of the

Republican Party at the time of this comic's release who has since switched back to the Libertarian Party.

- 200 L: Volume of a refrigerator.

As shown in the drawing of this part of the comic, the three persons mentioned above - Glau, Kucinich and Paul (summing up to 195 L) - could in principle all fit inside a standard refrigerator. Cueball thus attempts to push them all inside of one - though human bodies are not likely to be sufficiently malleable for this to succeed.[citation needed]

Mass[edit]

- 3 g - Peanut M&M: A small chocolate candy with a peanut inside.
- 100 g - Cell phone: The weight of a cell phone very much depends on the age, type etc.
- 500 g: A bottle of water contains 500 mL according to the volume section and thus has a mass of 500 g.
- 1–3 kg: Different types of laptops.
- 5 kg - LCD monitor: A modern flat-screen-style monitor.
- 15 kg - CRT monitor: An older-style, cathode ray tube-based monitor.

This ends the section on computer screens, which overrode the normal sequence by weight as the next two feline inspired entries are lighter than the two before. This was presumably done so that the reader's eye will be confused or amused at seeing (in the comic's caseless captioning font) CRT immediately followed by CAT in the vertical text column.

- 4 kg - Cat, 4.1 kg - Cat (with caption): Refers to the internet's love of putting captions on cats. Usually, this is done in a graphics program, but here the cat is actually physically carrying around his caption. The "with caption" part is most likely a reference to 262: IN UR REALITY, where Black Hat glues captions to cats, after running out of staples.
- 60 kg - Lady: For instance if she is Summer Glau - could be her again depicted in the comic - the average weight of an adult woman.
- 70 kg - Dude: Here depicted as Cueball who is the average guy, and 70 kg is average weight for an adult man.
- 150 kg - Shaq: Shaquille O'Neal, a famously tall basketball player.
- 200 kg - Your mom,
- 220 kg - Your mom (incl. cheap jewelry),
- 223 kg - Your mom (also incl. makeup)

The last three refer to a common type of Your mom joking insult whereby someone insults someone else's mother in a (theoretically) creative way. Here, the comic slyly calls your mom fat, then implies she wears way too much jewelry and finally also 3 kg of makeup. This is a common theme in xkcd. (20 kg of "cheap" jewelry has several times the volume than 20 kg of gold jewelry, because of the difference in density.)

Title text[edit]

The title text refers once again to Summer Glau's Firefly character, River Tam, who (after being subjected to a long series of medical experiments) is severely mentally ill and often comes out with macabre — though scientifically accurate — pronouncements. In

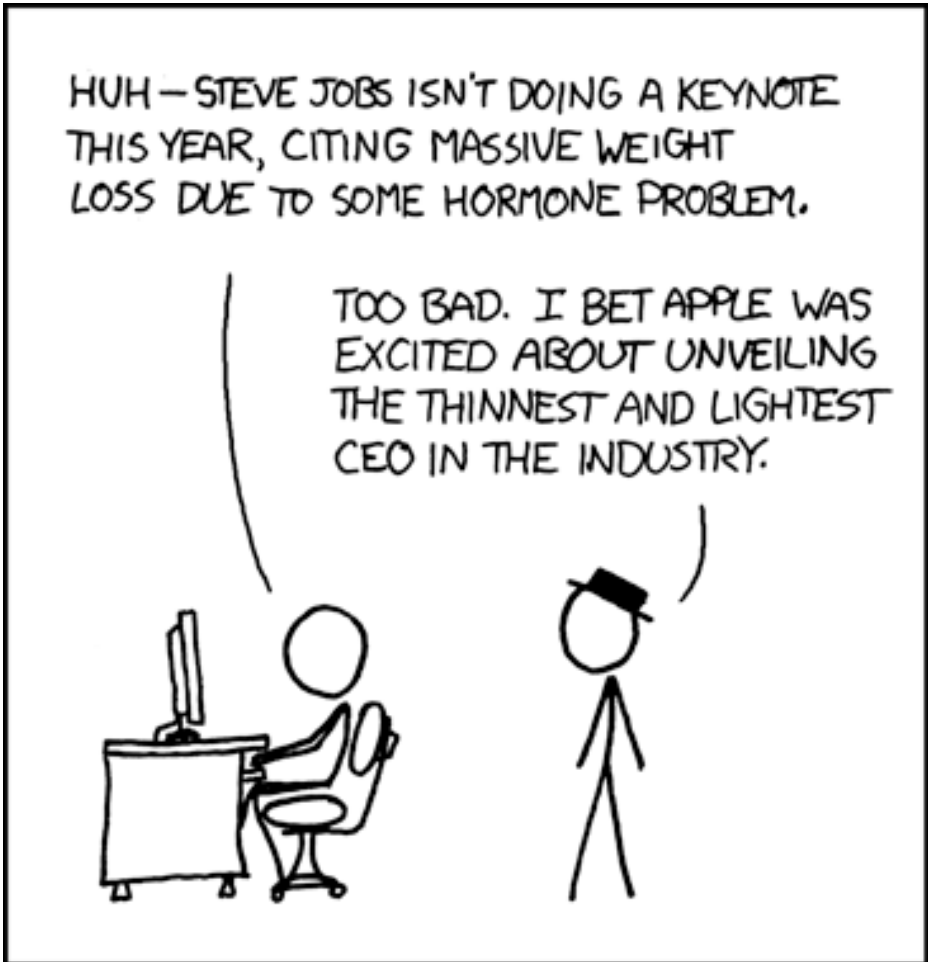
Firefly episode "Safe" (season 1, episode 7), she says: "The human body can be drained of blood in 8.6 seconds given adequate vacuuming systems."

Conversion table[edit]

The idea of the comic is to establish new metric reference points and not to resort to unit conversions. Nevertheless, the following table lists all units from the comic with their US customary equivalents:

#527: Keynote

January 07, 2009



He should be better soon -- now that the Apple Store is getting rid of DRM, Cory Doctorow will get rid of his Steve Jobs voodoo doll.

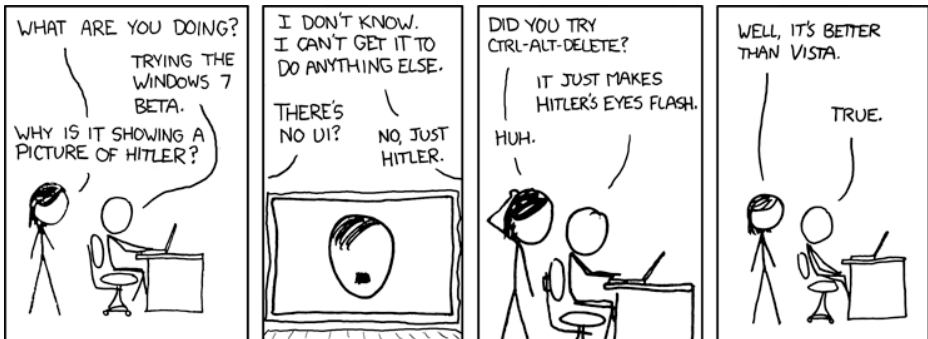
Explanation

According to this comic, Steve Jobs, the founder of the Apple company, lost a lot of weight due to a hormonal problem. Steve Jobs died on October 5, 2011, of pancreatic cancer the day before Randall released 961: Eternal Flame. Presumably, the cancer was the cause of Jobs' weight loss, although it was not public information at the time the comic was posted. Black Hat then mentions that Apple was probably excited to announce its thinnest and lightest CEO in the industry. This comment is a parody of Apple's tendency to release thinner and lighter iterations of its products. Steve Jobs' weight loss would certainly make him a thinner and lighter CEO.

The title text refers to Cory Doctorow, a blogger, journalist, and science-fiction author. Doctorow is opposed to the technology called Digital rights management (DRM for short). DRM is designed to be abused by large corporations with negative consequences for consumers but is disguised as a copyright protection system. Randall jokingly proposes that Steve Jobs is only sick because Doctorow was torturing him with Voodoo dolls for Apple's use of DRM.

#528: Windows 7

January 09, 2009



Disclaimer: I have not actually tried the beta yet. I hear it's quite pleasant and hardly Hitler-y at all.

Explanation

This comic came out 2 weeks after the beta version of the at that time not yet released Windows 7 got leaked on the internet, and 2 days after a trojan-infected version got leaked as well. Megan is observing Cueball use a laptop on which he has installed the Windows 7 beta. However, the alleged Windows 7 beta is showing nothing but a picture of Adolf Hitler and Cueball is unable to do anything. This could hint at the version containing malware. Cueball then presses Control-Alt-Delete (the well-known Windows Secure Attention Sequence which opens Task Manager or displays a list of options which includes 'Shut Down' and 'Restart') as suggested by Megan, but only manages to make the picture's eyes flash.

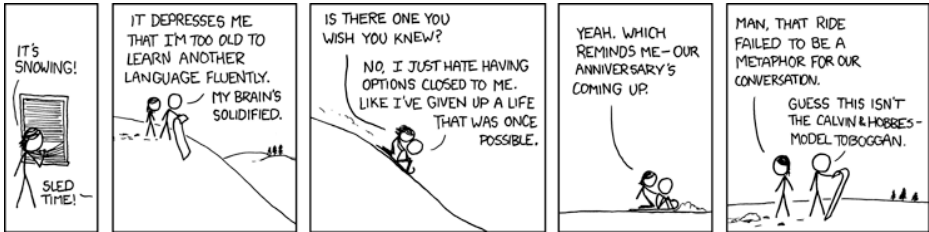
The fourth panel shows Megan commenting that this Windows 7 beta is better than Windows Vista, to which Cueball agrees. The joke is that Megan deems a mostly non-functional and vaguely sinister OS, which is likely malware, better than Windows Vista, which was generally perceived as one of the worst Windows OSes.

The title text is a disclaimer stating that Randall has not tried the beta at the time this comic was written, but what he has heard about it he regards as at least mildly positive. However, he also damns it by faint praise, referring to it as hardly "Hitler-y" at all, a statement that could raise warning flags, as one would not generally expect an operating system to be able to be described as

"Hitler-y" to any degree at all. The word "Hitler-y" is implied as an adjective to describe Adolf Hitler.

#529: Sledding Discussion

January 12, 2009



If you get your hands on that one, it's the worst place to have a breaking-up conversation.

Explanation

Cueball and Megan have a perfectly normal sled ride down a perfectly normal hill (engaging in what's traditionally a children's pastime)[citation needed] while Cueball is complaining that he has grown too old for certain things – like learning another language fluently (but not for taking a sleigh ride – although he does not really seem to enjoy it). There is a hypothesis, called the critical period hypothesis, which states that you can only learn a language fluently before a certain age.

Cueball hates that options are closed to him and feels like he has given up a life that was once possible. The joke is that this reminds Megan about their anniversary coming up. This means that she feels that she has given up a life that was once possible by staying so long with Cueball. Actually this may be the time when they are going to break up.

The reader would thus have expected something ironic to happen at the end of the trip but instead, the only humor in the last frame arises from their commentary on the lack of humor.

Calvin and Hobbes is an acclaimed newspaper comic strip that ran from 1985 to 1995. Calvin is a six-year-old child with an active imagination, and Hobbes is his stuffed tiger whom Calvin perceives to be alive through his imagination. The two frequently had philosophical conversations, often while sledding. Calvin sledded on

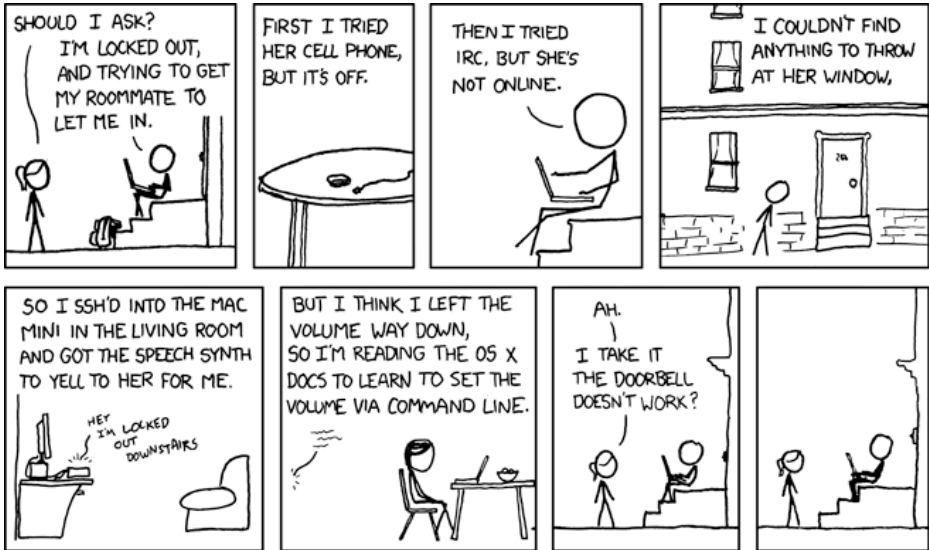
densely wooded hills near where he lived, and the ride would often serve as a perfect parallel to the conversation they were having; for example, in one strip, Calvin talks about how seemingly mundane decisions can nonetheless have lasting consequences, by pointing out how all the things they see as they continue down the hill (and eventually crash into a ravine) are a direct result of him having taken a particular fork early on. The depictions of sledding in the comics often gave the impression of being particularly dramatic and action-packed, far more than would be expected of such a ride in real life.

The title text notes that if you did have a Calvin and Hobbes toboggan, it would be the worst place to have a breaking-up conversation, perhaps because the sled itself would literally break up during the journey – with potentially dangerous consequences. This is also the clue to the fact that the comic is in fact about a break-up situation.

Calvin and Hobbes is also referenced in 409: Electric Skateboard (Double Comic).

#530: I'm An Idiot

January 14, 2009



Sadly, this is a true story. At least I learned about the OS X 'say' command.

Explanation

Cueball, locked out of his dorm/apartment, is trying to get his roommate Megan's attention so that she'll unlock the door. He tries various increasingly obscure ways of contacting her: calling her cell phone, IRC, the window, and finally remotely logging into their Mac computer (via SSH) to make it shout at her, which involves working out a way to turn up the computer's volume. Ponytail informs him of the most obvious solution—the doorbell—which prompts a moment of realization. The content of this realization—"I'm An Idiot"—is stated in the title of the comic. The humor of the comic derives from the rhythm of the panels: a long buildup followed by a short quip, then a sudden, silent pause for the implied realization moment.

Additionally some readers will be familiar with the behavior shown in the comic, since most every person who likes solving problems has experienced a moment of realization similar to Cueball's at one point or another. They, like Cueball, get distracted by solving an interesting problem because solving problems is fun, and fail to notice that the problem has an easier solution that they haven't considered. This same issue of getting lost in a sub-problem [in this case, the-sub problem of how to remotely control text-to-speech in OS X] at the expense of overall problem-solving ability is further covered in 761: DFS.

The title text states that this is a true story, so Cueball

must represent Randall. It also mentions that, although missing an obvious solution can be humiliating, one often learns a lot from trying new solutions, which would explain why the behavior persists.

This comic follows a similar storyline to 349: Success and 1518: Typical Morning Routine, as Cueball and Hairy respectively in these comics, encounters an issue and attempts proceedingly more absurd solutions to the issue.

#531: Contingency Plan

January 16, 2009



I TAKE THE JURASSIC PARK APPROACH TO PARENTING.

Kids are genetic experiments. We're just experimenting responsibly!

Explanation

Megan comments that Cueball is force-feeding their child so many sugary drinks that the child runs the risk of developing diabetes. Cueball responds that that is the plan, since if anything were to go wrong, they'll just have to stop giving her insulin, which will kill her. Cueball then comments that he thus takes the Jurassic Park approach to parenting. Bad parenting is a recurring theme in xkcd.

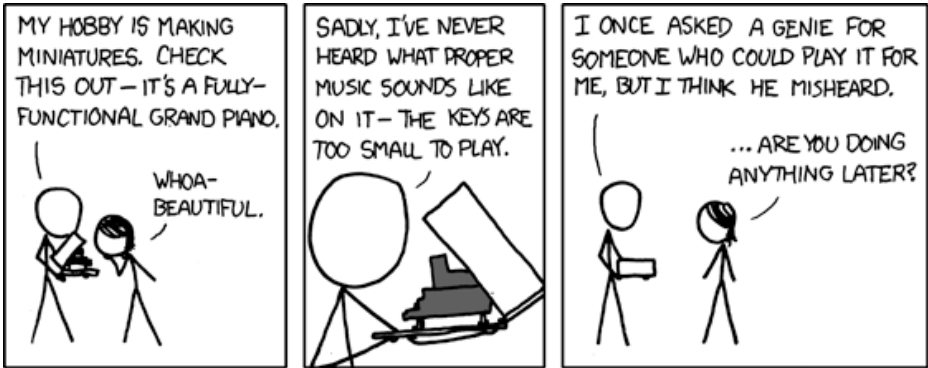
Jurassic Park is a series of books and films centering on a disastrous attempt to create a theme park of cloned dinosaurs. In particular, the park scientists give the dinosaurs lysine deficiency as a contingency plan, so that if some dinosaur were to escape, it wouldn't be able to survive in the wild. In practice, lysine can easily be obtained by eating protein-rich foods like red meat, lamb or pork.

The title text continues the theme, noting that having children is basically one big genetic experiment, and that Cueball is experimenting responsibly, by having a contingency plan, thinking ahead as to the possible consequences of his experiment.

The child interestingly cannot be seen in the crib. It may be that the sides of the crib are solid rather than barred like a traditional crib, or, more likely, Randall simply forgot to draw the child.

#532: Piano

January 19, 2009



Good thing he didn't make it smaller, or it'd need someone three inches tall to play it.

Explanation

This comic is the reverse of the old "twelve inch pianist" joke.

In the original joke, a man presents a miniature piano, which is played by man of proportionate size. When asked about it, he reveals that he found a bottle with a genie inside, but the genie misunderstood his wish, and gave him a 12-inch pianist.

The crux of the joke is that the word pianist sounds similar to the word penis. The man considers having a larger member to be desirable (presumably due to the stereotype that it will make him more sexually appealing), but loses out on the opportunity, due to the misunderstanding.

In this comic, the opposite happens: Cueball wished for a "twelve inch pianist" to play his miniature piano, but was misheard by the genie, implying that the genie instead granted him a "twelve inch penis." Megan quickly grasps the implication, and therefore wants to have sex with Cueball (in accordance with the aforementioned stereotype; and also judging from the weird tone in "...are you").

The title text suggests that if Cueball had made a smaller piano – and had thus wished for a smaller pianist – he would have instead received a smaller penis.

Genies (or the magic lamps containing them) are

mentioned in at least five other comics:

- 152: Hamster Ball
- 879: Lamp (which is also related to penises)
- 1391: Darkness
- 2193: Well-Ordering Principle
- 2741: Wish Interpretation

#533: Laptop Hell

January 21, 2009



The xkcd.com sysadmin has a Q2010, and I can attest that it can handle a fall down several flight of concrete steps. Relatedly, he's upset with me -- I hope he doesn't take revenge by messing with my site's contentDISREGARD THAT I SUCK COCKS

Explanation

The Devil Mephistopheles (named so in the official transcript) is greeting the new souls sentenced to Hell, and recognizes an executive from Fujitsu Ltd in the form of Hairbun. Mephistopheles accuses her of causing his favorite laptop, the Fujitsu Q2010, to be taken out of production. Mephistopheles is displeased because he thought it was a good laptop, just poorly marketed by Hairbun. Hairbun is confused and asks Mephistopheles why he is upset, as acts of evil are generally encouraged by the demons of Hell. Mephistopheles agrees but explains that Hell also needs good laptops, and in her case their need for laptops was greater than the need for her evil works. Though, Mephistopheles then goes on to confess, that it would not really have mattered as Hell has an exclusive deal with Fujitsu competitor, Sony, and he could not have bought the Fujitsu Q2010 anyway.

This would explain why the sale of the laptop failed, and Hairbun also exclaims I knew it to indicate that she had suspected it was weird that Sony did so well. When one strikes a deal with a devil from Hell, their affairs in life go great, but of course one has then sentenced their soul to eternal damnation in Hell when one eventually dies.[citation needed] Seems like Sony has done so according to this comic.

This comic is likely a wish fulfillment fantasy by Randall for the canceling of his favorite laptop, the Fujitsu Q2010. Exclusivity deals are typically thought ill of as

they are bad for competition. Also, since exclusivity deals solely benefit the provider, there are often reciprocal arrangements for the purchaser. This implies that the devil has influence at Sony. Likely, Sony was chosen as the electronic distributor to Hell because of the Sony rootkit scandal. This scandal inspired many to call Sony an evil company.


It is the second time in a short while that a demon was depicted in a similar fashion although without the trident and not in Hell. This devil was also named Mephistopheles in the caption of that comic 501: Faust 2.0.

The title text explains that Randall's system administrator is upset with him because he tested the system administrator's laptop by throwing it down several flights of steps. The systems admin is implied to have taken revenge childishly, by replacing part of the text with "DISREGARD THAT I SUCK COCKS" although it was almost certainly done by Randall as a joke.

The "suck cocks" part is a reference to a post in bash.org which went on to attain moderate fame.

#534: Genetic Algorithms

January 23, 2009



```
def getSolutionCosts (navigationCode):  
    fuelStopCost = 15  
    extraComputationCost = 8  
    thisAlgorithmBecomingSkynetCost = 999999999  
    waterCrossingCost = 45
```

GENETIC ALGORITHMS TIP:

ALWAYS INCLUDE THIS IN YOUR FITNESS FUNCTION

Just make sure you don't have it maximize instead of minimize.

Explanation

In the computer science field of artificial intelligence, a genetic algorithm is a search heuristic that mimics the process of natural evolution. This heuristic is routinely used to generate useful solutions to optimization and search problems. Genetic algorithms belong to the larger class of evolutionary algorithms, which generate solutions to optimization problems using techniques inspired by natural evolution, such as inheritance, mutation, selection, and crossover.

In particular, genetic algorithms are designed to evolve, with various mechanisms being used to mimic natural selection. One such mechanism is to assign "costs" to various aspects of the program, and to select for programs which assess a fitness function such as calculating the least sum of all these costs (thus mimicking organisms in an environment where they have to compete for limited resources) versus any measurable benefits.

The line indicated by an arrow is a reference to the Terminator series, in which the main antagonist is an artificial intelligence known as Skynet that seeks to destroy all humans. By setting an absurdly high cost for an algorithm transforming into Skynet, the coder makes a preventive measure against the algorithm achieving such sentience.

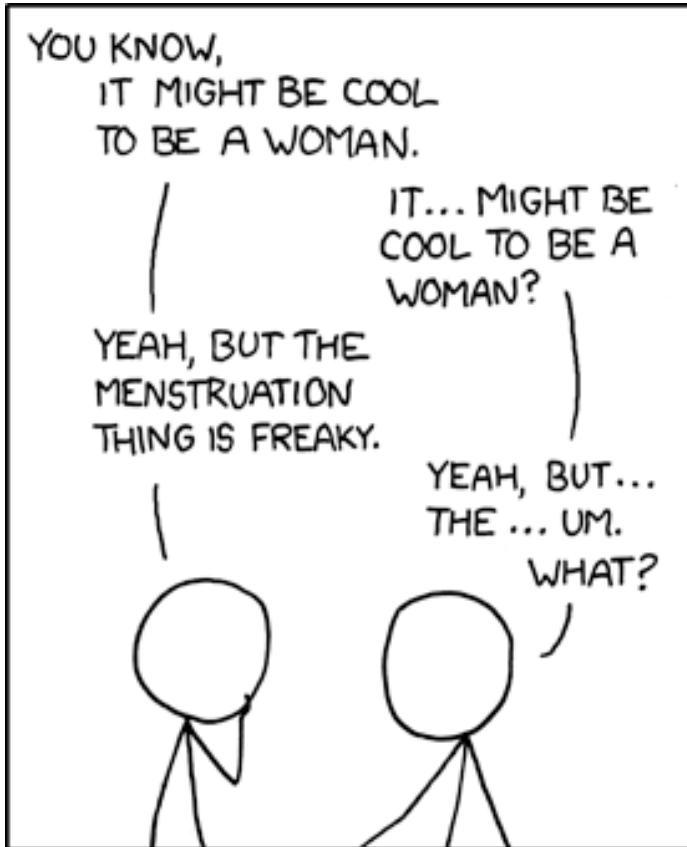
The line about water crossing is a possible reference to

the old computer game The Oregon Trail, in which crossing water was hazardous. This video game was referenced again in 623: Oregon.

The title text refers to the method by which the program select the desired option, with minimizing being where the program seeks the lowest possible number, and maximizing where the program seeks the highest possible number. When dealing with cases such as generating profit, maximization would obviously be preferred over minimization; but selecting maximization here would be disastrous as it would always chose the BecomingSkynet option before any other due to its massive cost.

#535: It Might Be Cool

January 26, 2009



'And ovaries. Man, ovaries, huh?' [awkward pause] '... faithfully.'

Explanation

Cueball (or Randall) is musing about the possibility of being a woman, to the confusion of the man next to him. His uninsightful rambling would likely be unimpressive and somewhat odd in most situations, but not odd enough on its own to prompt the second man's baffled reaction. However, the true reason for his confusion is revealed by the caption: Cueball is administering the presidential oath. The oath is administered by reciting it to prompt a new president to repeat it back to them. However, he botches it completely by forgetting about his task and wondering aloud about an unrelated topic. Thus, the president's confused question at the beginning is not him asking for clarification; he is repeating what he at first believed to be the oath of office, but got flustered when he realized Cueball had deviated from the script. When Cueball then continues by replying that "the menstruation thing is freaky," the president is completely derailed.

On January 20, 2009 the inauguration of Barack Obama's first office took place. Chief Justice John Roberts, who was administering the oath, made a mistake while reciting the words. This comic references the event and wildly exaggerates the deviation from the oath for comedic purposes.

In truth, the error was rather small: the oath as prescribed in the constitution is:

Due to a missed memo on the pauses planned by the Chief Justice, Obama inadvertently interrupted Roberts during the first phrase - Roberts begins by saying I, Barack Obama, do solemnly swear, and Obama repeats his name while Roberts finishes that sentence. This disturbs Roberts who was not using notes, and he rendered the next phrase as "that I will execute the office of president to the United States faithfully," misplacing the word faithfully and saying president to instead of president of. Obama repeated, "that I will execute", then paused. Roberts attempted to correct the wording, but stumbled: "the off— faithfully the pres— the office of President of the United States." Obama then repeated Roberts' initial incorrect wording.

However small the error was it was big enough that Obama did retake the oath of office the day after the mistake was made.

The title text continues the wondering about being a woman going on from the menstruation to the ovaries. To make sure it is clearly the oath mistake that is referenced the sentence ends with '... faithfully.' Thus mimicking the real mistake of placing this word last.

Cueball might be an egg, an individual who is transgender and unaware of such.

#536: Space Elevators

January 28, 2009



If you think space elevators are good, but just too boring and practical, check out the 'space fountain'.

Explanation

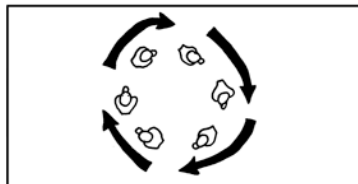
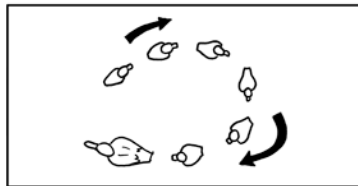
Arthur C. Clarke was a science fiction writer and a futurist. The quoted remark provides a benchmark for how long it will take to create something as massive and advanced as a space elevator: when technology reaches the point where the idea is considered seriously rather than dismissed out of hand, about fifty years of further effort will make it a reality.

Mind of Mencia was an American television comedy series running from 2005 to 2008. Cueball implies that the show is so unfunny that putting it on every channel would destroy everyone's sense of humor, thus preventing them from laughing at anything, space elevators included.

The space fountain, mentioned in the title text, is another proposed method of overcoming the planet's gravitational barrier, involving an effect similar to that of a coil gun.

#537: Ducklings

January 30, 2009



OPERATION: DUCKLING LOOP

DUCKLOOP'D?

Explanation

The comic shows an elaborate plan. The mother and her ducklings will always walk in a line. The ducklings will either follow their mother, or the duckling in front of them.

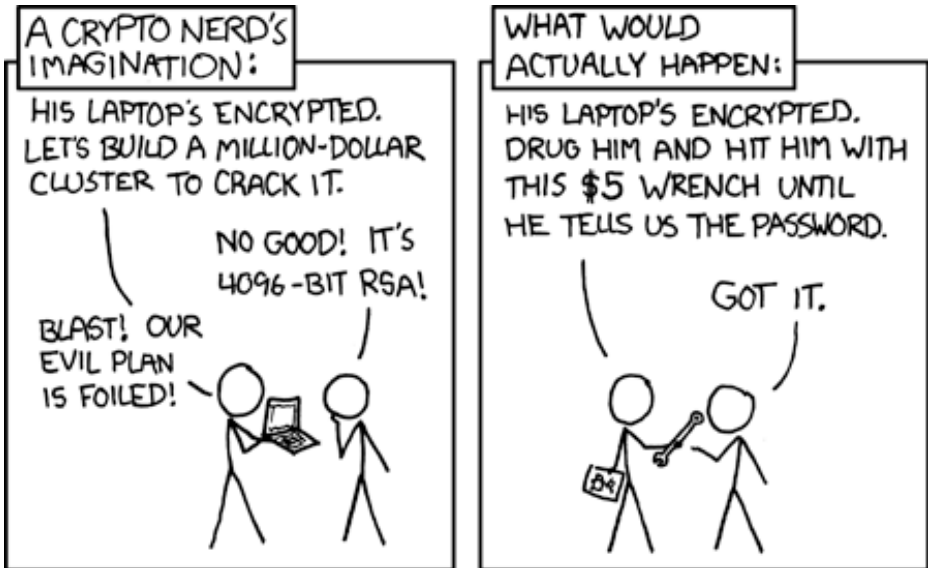
Cueball scares the mother duck, so she starts running away, her children following her in a line. Then Megan snatches the mother duck, leaving the first duckling to start following the last duckling, causing the ducklings to walk in a loop. Hence the caption at the end - "Operation: Duckling Loop." However, eventually the ducklings will probably realize something has gone wrong,[citation needed] and break the loop.

This behavior occurs naturally in real life with creatures that are less smart than ducks, such as sheep and ants (the phenomenon is called an ant mill).

The title text refers to a meme called "Duckrolled", where one would post a link to a picture of a duck on wheels. It became much more famous in its later incarnation as the Rickroll.

#538: Security

February 02, 2009



Actual actual reality: nobody cares about his secrets.
(Also, I would be hard-pressed to find that wrench for \$5.)

Explanation

The "crypto nerd" (short for cryptography in this case, not cryptocurrency, which was only invented a few months before this comic) would be concerned with strongly encrypting data on their personal machine. This would conceivably come in handy when "villains" attempt to steal information on his computer. The crypto nerd imagines that due to his advanced encryption, the crackers will be ultimately defeated. Randall suggests that in the real world, people with the desire to access this information would simply use torture to coerce the nerd to give them the password. Both panels also reference the amount of money used to access the data. In the first the villain is willing to use millions of dollars to construct a super computer which may still not fulfill their aim, while in the second, he simply uses a \$5 wrench and 'the personal touch'. The comic effectively states, completely accurately, that the weakest part of computer security is usually not the computer, but the user.

RSA is a commonly used public key encryption method. Current standards typically use 1024, 2048, and (more recently) 4096 bit keys. These encryption methods are not yet (feasibly) breakable. A 4096-bit key will remain unbreakable for the foreseeable future.

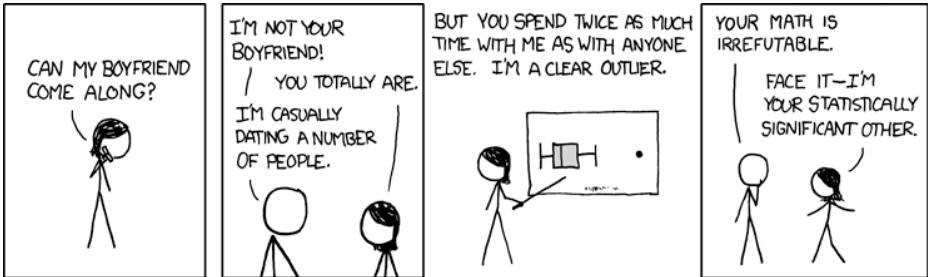
To be resilient against this sort of "attack", cryptographers have devised schemes of deniable encryption, where attackers either cannot prove that

encrypted information exists at all, or that allows the user to provide a password that reveals one (innocuous, or embarrassing but not illegal) secret without giving any indication that there is a second password that reveals the more important secret.

The title text pokes fun at typical users, who do not have data that would be worth anything to anyone but themselves. Therefore, it is unlikely that the above situation would ever occur. Additionally, the wrench used in the second panel is large, and presumably more than the \$5 referenced by the thug.

#539: Boyfriend

February 04, 2009



... okay, but because you said that, we're breaking up.

Explanation

In classical statistics, statistical significance is used to determine whether a conclusion can be confidently made about the implications of a given set of data. If some data set is determined to be an appropriate sample of a given population, then conclusions can be made by determining trends in the data. Since one can never be completely sure that their data is truly representative, or their statistical analysis completely accurate, calculations of the likelihood of error are made. Once these calculations are made, it can be decided that a given conclusion is statistically significant because it passes a certain threshold for the likelihood of error. Because the statistical analysis that was done concluded that it is significantly more likely that the conclusions made are accurate than inaccurate, these conclusions are termed statistically significant.

In this case, Megan has analyzed the amount of time that Cueball spends with her versus others in his life. Based on the data she has gathered, she constructed a box plot. A box plot is a way to present data that utilizes boxes to show the range that a certain percentage of data points fall into. The boxes denote quartiles, so the large box demonstrates the range between the lowest and highest quartile, and the line in the center of the box denotes the median of the entire data set. The bars extend to the outer limits of the data set, encompassing the highest and lowest points (but excluding outliers). Box plots are useful to show the spread of data, and how it may be

skewed. For more on box plots, see Box plot. Megan uses the data she has collected to show that the amount of time that Cueball spends with her is significantly higher than the amount of time he spends with others, since the amount of time they spend together is high enough to be an outlier when she completes a statistical analysis of the time he spends with people in his life.

Cueball accepts her claim, and she responds with a witticism that combines the phrases "statistically significant" and "significant other".

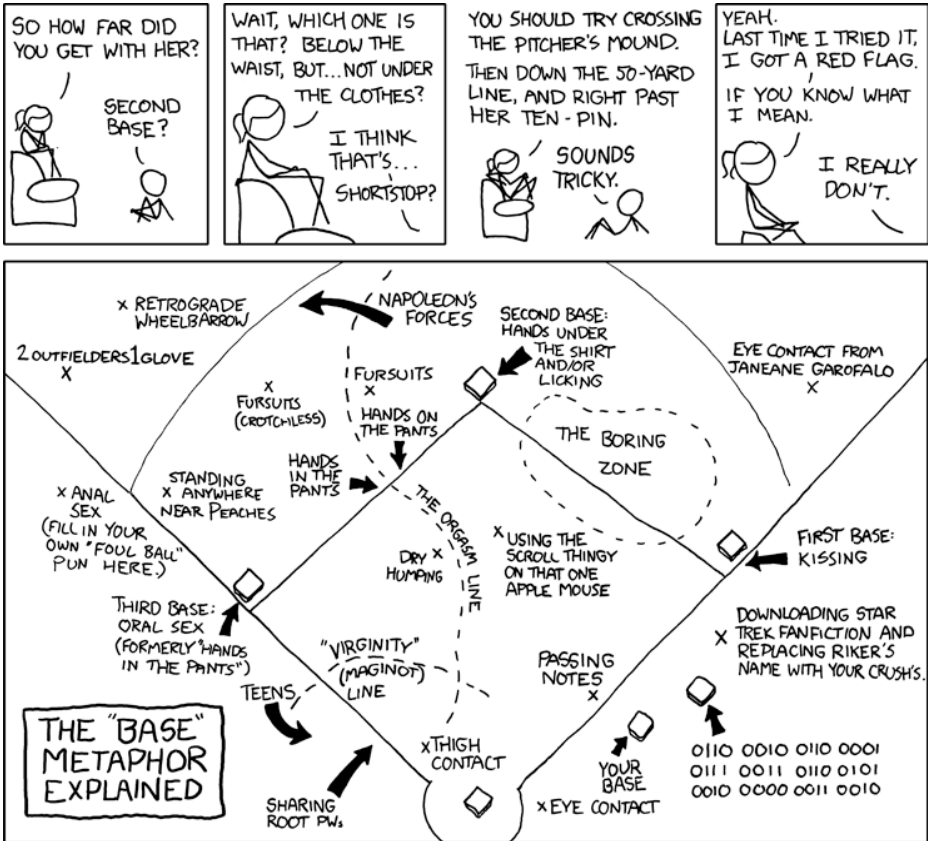
The title text can be interpreted in multiple ways. Firstly, Cueball may be resistant to the title of boyfriend. As he indicates, he is currently casually dating multiple people, and may therefore be resistant to any single individual attempting to establish a monogamous relationship. It could also be inferred that anyone taking the time and effort to statistically examine their relationship with him is off-putting, as this behavior could be viewed as obsessive. It could also be theorized that the term statistically significant other seems cold, and Cueball would rather date someone who makes him feel as though their relationship is significant, not simply someone who is an outlier in terms of time spent together. However, we know how Cueball responds to graphs without axes, so part of his rejection may stem from his disdain of her graph's lack of necessary units. (For all we know, he could be spending significantly less time with Megan than with others!)

...Or it could just be that it's a cringe-worthy pun, and

Cueball doesn't appreciate Megan being so pun-happy. The unduly[citation needed] severe consequences for an over-elaborate pun setup are analogous to how another Cueball gets his math license revoked over a pun.

#540: Base System

February 06, 2009



I once got to second base with a basketball player. She was so confused.

Explanation

This comic comes in two parts and is a pun on the baseball metaphor used to describe how far a date went regarding erotic actions. Many different versions of the baseball metaphor exist, with varying degrees of complexity. But it has rarely been described with as many details as the one drawn by Randall in this comic.

First part - the comic strip[edit]

In the first part, a four frame strip along the top, Ponytail and Cueball discuss how Cueball's date went. When Cueball answers Ponytail's question with "second base", Ponytail asks what that means exactly. They fumble around with the definition in panel two where Ponytail asks is that Below the waist, but... not under the clothes? Cueball tries to put this into the base system and suggest that this could be compared to the difficult shortstop fielding position in baseball, between 2nd and 3rd base. This fits with the position of Hands on the pants metaphor from the picture below the comic strip. Then Ponytail begins with yet another base analogy by mentioning crossing the pitcher's mound, but then suddenly she brings two more, very different, sports into the metaphor: American football (with the 50 yard line) and bowling (with the ten-pin). It certainly sounds tricky, as Cueball says. Ponytail then brings up a third sport in her elaboration; her reference to getting a "red flag" could refer to different sports, as many sports use flags, some of them red. It is, however, most likely a reference to racing in motor sport as the red flag is displayed when conditions are too dangerous to continue the session. This makes sense when looking at the

"translation" here below. Cueball, however, has not got a clue which he expresses when Ponytail asks him If you know what I mean.

(Note that this comic came out less than a week after Super Bowl XLIII, the final game of the 2008 NFL season, which was played on 2009-02-01).

Here is a possible translation of Ponytails comment:

This would mean that Ponytail was about to go down on another girl, while this girl had her period. Many people would find it disgusting to go down on a girl while she was menstruating, explaining why Ponytail brought it up when Cueball said Sounds tricky. However, Cueball doesn't seem to understand Ponytail's metaphors, explaining his replies of Sounds tricky and I really don't.

Second part - the baseball diamond[edit]

The second part, the diagram, depicts a much more complex version of the baseball metaphor, where baseball terms and jargon are used to describe the many and varied things human beings like to do in the bedroom. Explanations have been separated by position. In order to understand the terms used, one may want to consult this picture:

The "diamond" is the geometric pattern formed by the four bases - first, second, third, and home plate. Through the course of one side's turn (half of an "inning") players have a chance to move from one base to the next base in line: from first, to second, to third, and finally to home plate (scoring only if they make it to home plate). Thus there is a "progression" from one base to the

next of sexual activity in the metaphor, until climax is achieved (getting to 'home plate' and 'scoring a run'). In both cases, players can be removed before making it to the next "base" in the sequence.

The entries in this section are ordered roughly from home plate to first, to second, to third, and then to home plate again, in the counterclockwise direction that the players move.

- Eye contact is placed just alongside the initial stage where the 'player' has just stepped off the home plate and is starting to move towards first. This is a deliberate setup for the 'thigh contact' pun later just before home plate. First eye, then thigh contact. First then can the sex begin and you have finally scored by reaching the home plate.
- Passing notes refers to a common method of communication in the classroom in school, often used by students as a form of courtship. It is placed halfway between the start and first base - the point at which communication has begun.
- First base is kissing. This is one of the most common assigned meanings for what the 'first base' is in the baseball metaphor - as in, "getting to first base".
- The boring zone is the point between kissing and sexual teasing or activity - the point where intimacy has become normal but sexual behaviors have not been accepted yet. This is boring for many (stereotypically this goes especially for men). It can also be the point at which a workup is attempted from kissing to gentle stroking and finally to the overt sexual teasing that is found by the time you have gotten to second base.
- Second base is licking or hands under the shirt. Overt sexual

teasing, in an attempt to get the other person aroused.

- 'Hands on the pants' and 'hands in the pants' are two activities that happen in a very short distance of each other during an average sexual encounter. They are also separated by the 'orgasm line', indicating that teasing has stopped and actual sexual activity has begun.
- Third base is oral sex. Oral sex is often used to prepare or arouse another person in preparation for intercourse, although it can be performed until one or both climax. In older versions of the baseball metaphor, third base was "hands in the pants" instead, which has been moved to earlier on the line in this new, "modern" version - or at least, Randall's conception of it.
- The Virginty line, which is also named, in brackets, after the Maginot Line, a series of French fortifications that were thought to be impenetrable during the lead-up to World War II. This line provides a direct "barrier" to the path between third base and a home run. The Maginot Line was thought to be completely impenetrable until it was bypassed by the German army during WW2 through the Ardennes forest, whereupon it was encircled and destroyed. Virginty is often seen as an impenetrable barrier, or an unwillingness, up until arousal and desire conspire to make it go away rapidly.
- Teens, naturally, having a propensity for hormone-driven sex, bypass the Virginty line with ease.
- Sharing root PWs (passwords) is placed very close to home plate. As a system administrator, the one thing you never, ever do is give anyone the root (core) password to an operating system, because anyone with the password is able to get unlimited access to the system to do whatever they please. Sharing a root

password with another person is a nerdy way of saying that you trust them on an intimate, deep level. In other words, it requires more trust than oral sex.

- Finally, there is home plate. In this diagram, it is unlabelled, but in all versions of the baseball metaphor, the home plate signifies sexual intercourse and climax. Scoring a "home run" with a sexual partner means you "took it all the way" and "scored a point"; i.e. got laid. Close to the home plate, the virginity line and orgasm line cross, as penetrative sex is rarely the most effective way for a woman to reach orgasm.[citation needed]

Inside the diamond, at the center of the mound, is the pitcher. Several odd positions are placed here in Randall's diagram.

- The Orgasm Line, which passes through almost every other play field, seems to be a divider that runs throughout the entire map that separates teasing and arousing behavior from overt sexual behavior intended to pleasure others.

Using the scroll thingy on that one Apple mouse is presumably here because the small, rounded scroll button can be imagined to be a clitoris. But it does not even get close to cross the orgasm line. (See also 243: Appropriate Term.) The Apple mouse mentioned is presumably the Apple Mighty Mouse, which has a small scrolling trackball instead of a scroll wheel, which is the usual method on most computer mice.

Fursuits (arousing, to some) become crotchless fursuits (overtly a sexual tool) when they cross the orgasm line.

Hands on the pants and hands in the pants are two related but different activities - hands on the pants is arousing but not past the orgasm line, whereas hands in the pants can give pleasure

enough to cross the orgasm line.

Dry humping is the activity of humping (thrusting against) a partner without one or both of them removing their clothes, in order to arouse or gain sexual satisfaction. The location is probably a combination of the fact that it lies somewhere between hands on/in the pants, is definitely not an activity that is considered "out there" (in the outfield), hasn't quite made it to 3rd base, but at least it crosses the orgasm line.

The infield is the part of the baseball field which is inside the baserunning paths (not inside the lines between the bases, because baserunners are allowed to run a certain distance outside those lines).

- Napoleon's Forces is a cartography joke, suggesting that all of this complicated positioning makes the image look like a map depicting military maneuvers (and also evoking the comical image of Napoleon's army marching through a land of sexual behaviors). The specific reference is probably to Charles Joseph Minard's famous diagram of Napoleon's 1812 Russian campaign, often cited as the best statistical graphic ever. It's mentioned in the title text of 731: Desert Island.
- Fursuits are anthropomorphic animal costumes worn by some members of the Furry Fandom, people who are fans of anthropomorphized (human-like) animals. Fursuiters are a small fraction of the entire fandom, (though most furies have expressed interest in owning one, some being unable to due to the high cost involved in commissioning one IARP), and are rarely used in sexual play.
- Fursuits (crotchless) are fursuits with no fabric or covering on

the groin (crotch) of the wearer, and as such are specifically intended for sexual play. They are placed slightly further "out there" on the field due to this being more unusual, and across the orgasm line.

- Standing anywhere near Peaches is referring to the musician Peaches who is known for her heavy use of sexual imagery.

The "outfield" is a group of players who are there to catch the ball if it goes away from the main play area (anything outside the upper curving line) and return it to play in a manner advantageous to their team. As they separated away from the main play area, the things in the outfield are often references to sexual behaviors that are "kinky" and "out there".

- 2outfielders1glove is a reference to the infamous 2girls1cup scatological site and associated meme. This has already been mentioned in 467: X Girls Y Cups.
- The Retrograde Wheelbarrow is a sex position, one referenced previously in 300: Facebook, making this a callback.
- Eye contact from Janeane Garofalo is a tie-in to the "eye contact" entry positioned near home base. It's possible that this is placed in the outfield because fantasizing about celebrities like Janeane Garofalo is a behavior that is often considered unusual, even though many people do it.

A foul ball occurs when a ball ends up in foul territory which is outside the foul line extending from either side of the diamond, the area is "out of play". Anyone who takes the ball into this area has committed a foul, and as such breached one of the acceptable rules of sexual conduct in the metaphor.

- Anal sex is a pun on the term "foul ball", as the anus is where fecal matter collects. The position is placed just outside the foul line.
- Downloading Star Trek fanfiction and replacing Riker's name with your crush is a reference to Star Trek: The Next Generation. Riker, the First Officer of the Enterprise-D, is often a subject of sexual desire among the fandom, and so taking a piece of fanfiction (fan-written, noncanon stories written about a piece of fiction) and replacing Riker's name with that of your crush is an ultra-nerdy way of indicating that they are attractive — so ultra-nerdy, it's creepy.
- The binary (i.e. base 2) numbers are an ASCII representation of the characters "base 2". The base of a number system is the number of unique digits required to represent numbers in that system. Binary is therefore a "base 2" system. This seems to be a little nerd sniping: wasting the time of anyone familiar enough with computing to know how to decode it.
- "Your base" is a reference to the original "base" metaphor mixed with a reference to the Zero Wing All Your Base meme. It is most likely a reference to masturbation (i.e. solo sex or you-sex and is in the foul area). First you make eye contact with a gorgeous girl (boy) and then you go home and satisfy yourself with a fantasy about all the things you would like to do with her (him). It's possible that this being here is also a stealth insult towards the reader — the reader's own base (him/herself) is "out of play" and thus undesirable.

If you are together with a basketball player and then tell her that you are now at second base, she might become very confused as bases are not an element in basketball. Also there is the joke that basketball players never get laid because they always jump before

they score.

#541: TED Talk

February 09, 2009



The IAU ban came after the 'redefinition of 'planet' to include the IAU president's mom' incident.

Explanation

The comics shows Randall as a presenter at the highly prestigious TED conference, a symposium about technology, entertainment and design. The illustrious list of former presenters includes amongst others Bill Clinton, Al Gore, Larry Page, Richard Dawkins and Gordon Brown. The conference is regarded as a forum for digerati. Every talk has a length of at most 20 minutes and is supposed to be as captivating as possible.

Randall's presentation, however, reduces the purpose of the conference to absurdity: The topic he wishes to point out to his listeners, is that of how to put an emoticon at the end of a parenthetical statement. One possibility that is shown is "Linux (or BSD :)", which looks mismatched because the emoji does not close the opening parenthesis. The other one, "Linux (or BSD :))" has a closing parenthesis, but makes the emoticon look double-chinned.

This question is of little practical consequence, although it received a lot of attention after publication of the comic. In the last panel, the TED conference is another item to add to his list of conferences from which he has been banned. On the list are other conferences from all sorts of fields, including every American furry convention.

The title text about Randall's ban from the IAU conference is a reference to the popular maternal insults

called "Yo mama" jokes. A common representative of the genre runs "Yo mama so fat, scientists have declared her the 10th planet." Those kind of jokes are a recurring theme on xkcd.

It can be inferred from 629: Skins, that Randall was banned from North American furry conventions due to being a "Skin", which is a furry whose fursona prefers going around disguised as a human. Depending on Randall's behavior, such an action could generate a lot of drama and, presumably, lead to convention bans.

Getting banned from attending a conference is a recurring theme on xkcd, and even in real life, Randall sometimes has bad ideas for conference topics, such as presumably not speaking for the entire conference. This was so far the sixth of eight comics to directly mention conference bans. The first to do so was 153: Cryptography.

The PyCon organizers made a response to this comic - see below under PyCon response.

Conferences where Randall is banned from[edit]

Here is a list of the conferences from which Randall has been banned according to this comic.

#542: Cover-Up

February 11, 2009



Man, this trick has saved me so many times.

Explanation

Black Hat and Danish are trying to clean up the mess that some bloody murder most likely performed by them has left. This story may thus be a continuation of 515: No One Must Know.

Another guy, Cueball, is on his way home and is about to arrive just when they are finishing the clean up. But then Black Hat realizes that the ceiling has also been stained (by the violent murder...) And now they do not have time to fix it.

But Black Hat knows how to deal with the situation, and when Cueball comes home, he says: "Did you know 'gullible' is written on your ceiling?"

Gullible means easily deceived or naive; an old and simple prank is to make an unlikely claim related to the word "gullible". For example, you might claim that the word "gullible" isn't in the dictionary, or that someone wrote the word "gullible" in the sky. The notion that you're deceiving the other person is embedded in the claim, so if they believe you (even for long enough to check), they're labelling themselves as gullible.

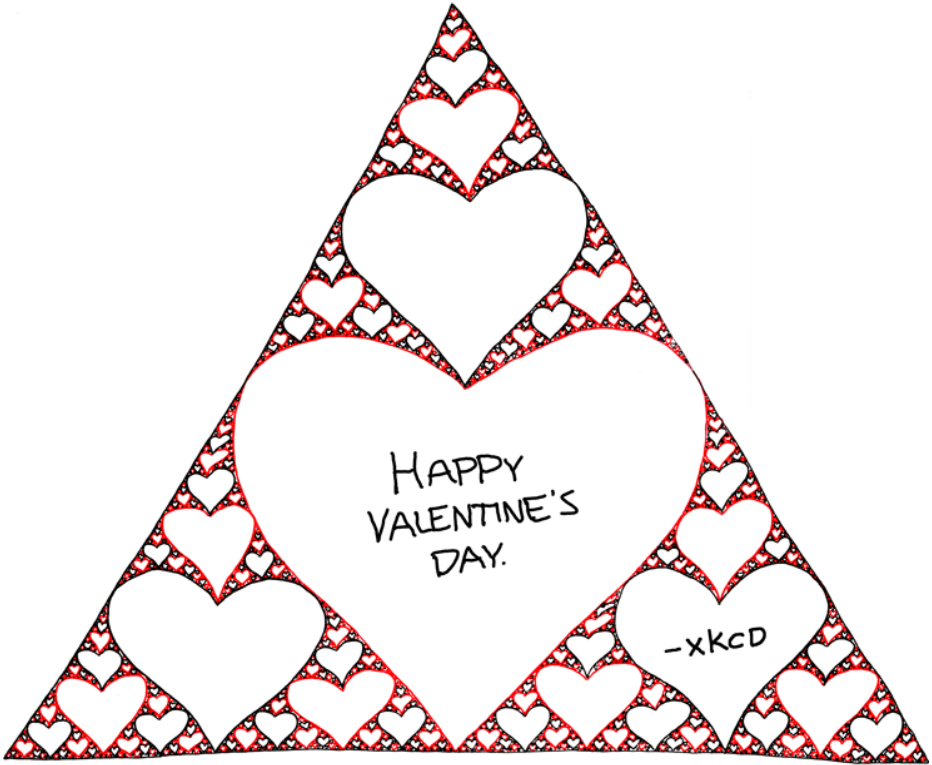
Here, Black Hat uses the existence of such pranks to his advantage. When he makes the claim, Cueball immediately catches the joke, and deliberately avoids looking at the ceiling, to prove that he wasn't fooled. Of course, preventing him from looking at the ceiling was

the entire point.

The title text is hinting that Black Hat has had to cover up killing people several times as this trick has saved him many times. Of course there could also be other things than blood that he had to hide (the money he just stole, drugs, etc.)

#543: Sierpinski Valentine

February 13, 2009



Especially you mouseover-text readers. You're the best.

<3

Explanation

A Valentine's Day card from Randall to the xkcd readers. It is written inside a parody of the Sierpinski Triangle, a Sierpinski Valentine.

The Sierpinski Triangle is a fractal pattern made of triangles, covering a space. The way it works is to draw a triangle and draw another (upside down) one in the middle. Choose the upper, left and right triangle and repeat the process. Another valentine in the shape of a heart is 63: Valentine - Heart.

The <3 in the title text is an emoticon for a heart and goes out to those of his readers that read the title text. Those who read it are usually more devoted to knowing that such a thing exists.

Another relevant comic to the Sierpinski Triangle is 95: The Sierpinski Penis Game.

A "circular version", in a form known as an Apollonian Gasket, can be seen at 17: What If.

#544: Pep Talk

February 16, 2009



Listen! They said a team of chess players coached by someone with no understanding of basketball would never be competitive in the NBA! Well, it turns out they're pretty perceptive.

Explanation

Another comic where Randall takes a less than serious look at sports.

The halftime pep talk of a basketball game is commonly used by coaches to inspire their team to either turn the game around, or to defend the lead, and to make strategic changes that will help them do so. Unfortunately, the basketball coach Cueball has absolutely no fundamental understanding of the sport, and has pulled his team (of Cueball-like players) into the locker room while the game is still in progress, not during halftime, enabling the other team to score at will.

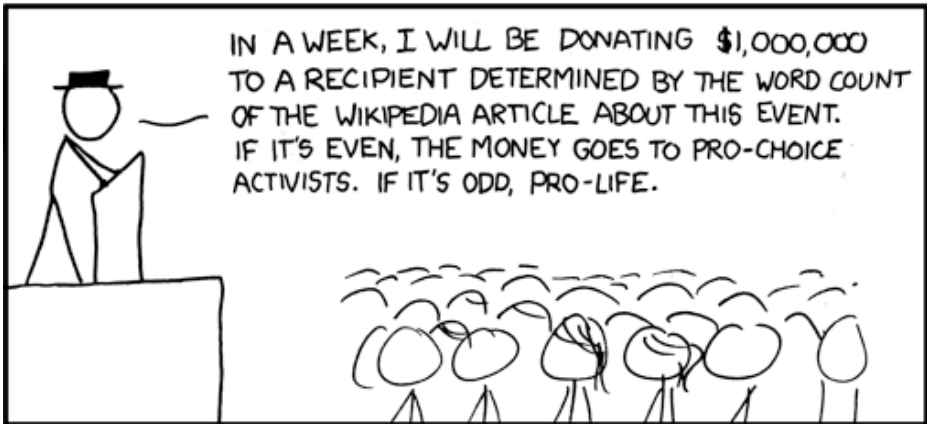
He could have tried to get a time-out, but still he would not have been allowed to take his team down to the locker room.

The title text parodies a common plot of, especially US, sports movies in which an inexperienced team (and sometimes coach) still manage to win a title after a highly motivational pep talk (see for instance *Hoosiers*). These pep talks usually take place during regular pauses of the game, and can lead to a come back from a seemingly insurmountable deficit. In this case the players are not even just poor basketball players but rather chess players and the coach knows nothing of the sport, the opposite of what is usually the case in said movies. And, of course, in this case those pessimistic about their chances were proven right.

#545: Neutrality Schmeutrality

February 18, 2009

TRIVIA: IT'S POSSIBLE TO CREATE EVENTS
WHICH WIKIPEDIA CANNOT COVER NEUTRALLY



'Hey, everyone, you can totally trust that I didn't do a word count on MY edit!'

Explanation

Wikipedia is an online encyclopedia with content developed and submitted by volunteers around the world. In fact, its slogan is "Wikipedia, the free encyclopedia that anyone can edit." Most articles on the site can be altered by anyone with access to Wikipedia.

Wikipedia has set some standards for its operation, which it refers to as the "Five pillars of Wikipedia". One of these pillars is titled "Wikipedia is written from a neutral point of view."

Pro-life and pro-choice refer to two opposing viewpoints in the debate of the moral and legal rights concerning abortion. For many on both sides, it is a very emotional topic.

Black Hat, like the class-hole he is, has decided to prove that you can create an article which fundamentally cannot remain neutral. Since his charitable donation is determined by the word count of the article, any submission to Wikipedia must result in Black Hat's money supporting either pro-life or pro-choice activists. With a reward of one million dollars, it is unlikely that either side would allow an article that would result in the other side winning to remain unedited. The edits need not even overtly change the neutrality of the tone of the article – by simply rewriting 'unbiased' phrases with a differing number of words, the effect of the page is drastically flipped.

The title of the comic uses an old (read, "pre-Internet") meme, possibly of Yiddish origin, known as shm-reduplication. The speaker replaces the initial consonant cluster (have it 0, 1 or even 2+ consonants) with the cluster "schm", read /ʃm/, and says the new word after the unadulterated word, as in the title where it is "N" that has been replaced. This denotes an active apathy or an intentional disregard of the authority (for it is usually an authority or someone in a similar position) being mocked. In this case, Black Hat is disregarding Wikipedia's neutrality doctrine with his word count dependent donation rule.

The title text is an imagined statement from a Wikipedia contributor attempting to assert the neutrality of their submission, claiming no word count was performed before posting. However, it is nearly impossible to trust that anyone editing such an article would not make an attempt to shift the result in their side's favor, since it is impossible to know whether someone performed a word count.

#546: Music DRM

February 20, 2009



Just yesterday I bought my first non-DRM'd songs (The Last Vegas, in keeping with my 'I only listen to things from Guitar Hero' theme).

Explanation

Here, Cueball is commenting in a comment thread that he authored about the negative traits of DRM, (usually "Digital Rights Management", but some, such as Richard Stallman, prefer the term "Digital Restrictions Management"). Cueball has a point: DRM, while meant to fight those who download media through 'dungeon sketchy' maneuvers, risks locking out legitimate owners. In turn, this turns off legitimate buyers from buying the songs, thus hurting artists. Of course, this would be true if the major stores sell music with DRM. Megan, wanting Cueball to make peace and enjoy his goal, makes the following choice quote: 'Close the comment thread, get out the debit card, buy us some music, and let's rock the fuck out', while she shows the sign of the horns. The problem is that Cueball is arguing for the enjoyment of arguing, not out of any actual belief in what he's arguing about.

The title text references 132: Music Knowledge while implying that Randall is not really a music fan, since he would only be interested in music that appears in the games that he plays.

#547: Simple

February 23, 2009

DO YOU HAVE ANY THOUGHTS
REGARDING THE PARTICLE ACCELERATOR'S
TERTIARY F.E.L. GUIDANCE SYSTEM?

WE CAN'T PUT THE BROKEN PART IN
THE MACHINE. IT WOULDN'T SMASH
THE RIGHT TINY THINGS TOGETHER.
THEN THE MACHINE MIGHT BREAK.

THAT WOULD BE VERY BAD.



I SPENT ALL NIGHT READING SIMPLE.WIKIPEDIA.ORG,
AND NOW I CAN'T STOP TALKING LIKE THIS.

Actually, I think if all higher math professors had to write
for the Simple English Wikipedia for a year, we'd be in
much better shape academically.

Explanation

There are three Cueballs discussing a particle accelerator. One Cueball asks the others about the "tertiary Free-electron laser (F.E.L) guidance system". As this is a fairly technical topic, we would expect a response filled with scientific jargon. The joke is that the other Cueball instead responds in a much simpler manner. He uses simple phrases such as "smash the right tiny things together" and "that would be very bad".

As the caption below the comic notes, Cueball (probably Randall) has spent the previous night reading the Simple English Wikipedia, a simplified version of Wikipedia intended to be easier to understand, and now he finds himself using similarly simple syntax. For example, the article for a particle accelerator describes it as "a machine that makes really tiny things called particles travel at very high speeds." This is similar to the simple response given by the responding Cueball. In the actual comic, Cueball was able to effectively communicate the dangers of using a broken F.E.L. using simple syntax similar to the style of the Simple English Wikipedia.

From the title text, Randall believes that if people teaching advanced mathematics followed this style, their subject would be more accessible. The implication is that more people would be drawn to studying mathematics and that (naturally) the world would be a better place because of this, ironically most likely true!

This concept was later revisited in 722: Computer Problems, 1133: Up Goer Five, Thing Explainer (probably most notably), 1322: Winter, 1436: Orb Hammer, 2163: Chernobyl, and 2809: Moon.

#548: Kindle

February 25, 2009



I'm happy with my Kindle 2 so far, but if they cut off the free Wikipedia browsing, I plan to show up drunk on Jeff Bezos's lawn and refuse to leave.

Explanation

The Amazon Kindle is a device that allows people to read books via ebook format. The comic was published three weeks after Amazon released the Kindle 2, which included the ability to read Wikipedia articles via the 3G connection that was included with the device.

Cueball remarks that "ebooks are for chumps", but goes on to explain the real reason for purchasing a Kindle. Since it has free cellular web access, he could navigate through any city (presumably with 3G access), assisted by Wikipedia and Wikitravel.

Megan believes she has heard such a description of a device before and snatches the Kindle away from Cueball. When she scratches off the Amazon Kindle logo at the top of the device she reveals that the device is actually The Hitchhiker's Guide to the Galaxy. This fictional electronic encyclopedia is described in the real-life franchise of the same name. Those works recount the tale of a travel editor who works for and owns a copy of the Guide, which provides travel tips throughout the galaxy, including an entry for Earth. The comic suggests that Amazon simply re-brands copies of the Guide as Kindles.

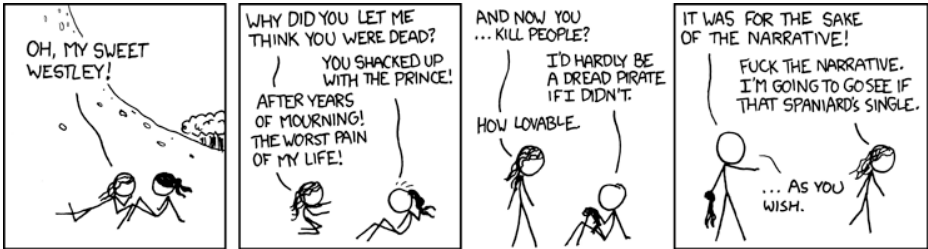
The title text refers to the great utility of having the ability to access Wikipedia for free on an easy-to-carry device. The speaker states that should this utility ever become disabled, he would stage a drunk protest on the

lawn of Jeff Bezos, the CEO and founder of Amazon.com. This method of protest is used by the protagonist of the Hitchhiker's series, in the beginning of the first book, in an attempt to prevent his house from being demolished, by lying in front of the bulldozer (in vain).

Amazon warned customers using 1st and 2nd generation Kindles in 2021 that 3G connectivity will cease to work, because network operators are upgrading their networks from 3G to 4G. Since this is not Amazon's fault, a drunk protest doesn't seem appropriate.

#549: Westley's a Dick

February 27, 2009



Inigo/Buttercup 4eva <3

Explanation

This is an alternate take on the 1973 fantasy romance novel *The Princess Bride* written by William Goldman which became a film in 1987.

In the movie the main character, Buttercup, believes she has lost her first love to the Dread Pirate Roberts years ago. In the present she is considered one of the most beautiful women of the land and so is being married off to a prince. To provoke a war she has been kidnapped by mercenaries, one of whom is a very honorable Spanish swordsman named Inigo Montoya. A man claiming to be the Dread Pirate Roberts rescues her. On verifying his identity as Roberts, she attacks him by pushing him down a hill. While tumbling down the hill he shouts back "as you wish" identifying him as her first love. She tumbles after, landing on top of him as in the start of this comic.

There are, however, several "dick moves" Westley must have made in order for the film's narrative to make sense.

Westley breaks the fourth wall and claims he did all of these things for the sake of the narrative. In other words, he did it to make the story better.

In the comic Buttercup realizes that Westley has behaved like a dick and chooses to give her love to Inigo Montoya. But in the movie, Westley and Buttercup end up together in spite of this behavior!

The title text shows what looks like a message she and Inigo have written together, for instance in a heart on a tree. Inigo is the Spaniard referred to by Buttercup. Their names, then forever (4eva) and a heart (smiley heart = "<3"), implying they did end up together according to this version of the story. Alternatively, it could simply be the narrator expressing his wish that this will come to pass.

It is not the first time Randall has referenced this movie, as the Dread Pirate was referenced in 345: 1337: Part 5, and a quote from this movie is in the title text of 1427: iOS Keyboard. So it seems like a film that has some meaning for Randall.

Note: It's quite possible Westley hasn't been killing people as a pirate at all. People had been surrendering to The Dread Pirate Roberts without a fight for years before he took over the role, due to the terror of his name. Of course, there may be a few people who needed to be killed, over the years, but the implication in the book (and movie) is that at least most surrender without a fight and are presumably unharmed.

If you haven't seen the movie or read the book, you may find it helpful to read the synopsis of the book [here](#).

#550: Density

March 02, 2009



CONS: RUINED LIFE.

PROS: SENTENCE SET THE NEW
MEME DENSITY RECORD.

If only I had asked 4chan for ideas for what I should do to prevent this!

Explanation

This comic depicts a sex scene with Cueball in bed together with Megan, and a sentence being spoken by Cueball. The sentence's overt meaning suggests Megan doesn't wish to become pregnant, but Cueball has prematurely or unintentionally ejaculated inside her. The sentence contains five popular (at the time) memes:

- **Yo Dawg:** With the full meme having the form "Yo Dawg, I herd you like (noun X), so I put an (noun X) in yo (noun y) so you can (verb x) while U (verb y)", this is the largest meme used in the sentence, and lays out the overall structure of the sentence. The greeting at the beginning can be changed to "Sup Dawg" as in this comic.
- **I herd u liek Mudkips:** The misspelling of words "herd" (heard) and "liek" (like) come from this meme. While this meme is usually used with Mudkip (a Pokémon), in this case the noun has been replaced by something she didn't like.
- **How is babby formed?:** The expression "forming babby" (with the misspelling of "baby") comes from this meme. This meme comes from a question that was originally asked on Yahoo! Answers. The full question was "how is babby formed / how girl get pragnent". This meme was also referenced in the title text of 481: Listen to Yourself and in 522: Google Trends.
- **I Accidentally:** This meme carries the pattern of omitting an important verb, leaving the reader

wondering what had happened accidentally. In this case the omitted verb is presumably "came" or "ejaculated". This meme was referenced again in 997: Wait Wait.

- In your base: This references the Starcraft meme "im in ur base, killing ur d00ds." It also might be used for its relation to baseball metaphors for sex, which was also referenced in 540: Base System).

In plain English, the sentence roughly means:

The comic then goes to describe the pros and cons of the situation. "Ruined life" is listed as a major downside, as he may have caused a girl to become pregnant against her wishes, and may have to father a child with her. The usage of memes in response to the situation also conveys an uncaring attitude that is likely to put a damper on their relationship even if she did not get pregnant. On the other hand, it is noted that the sentence could set a new record for the density of memes (most memes packed into the fewest number of words) which can be considered a positive. This explains the title of the comic, though it will be a very superficial and meaningless record, especially when weighed against the downsides.

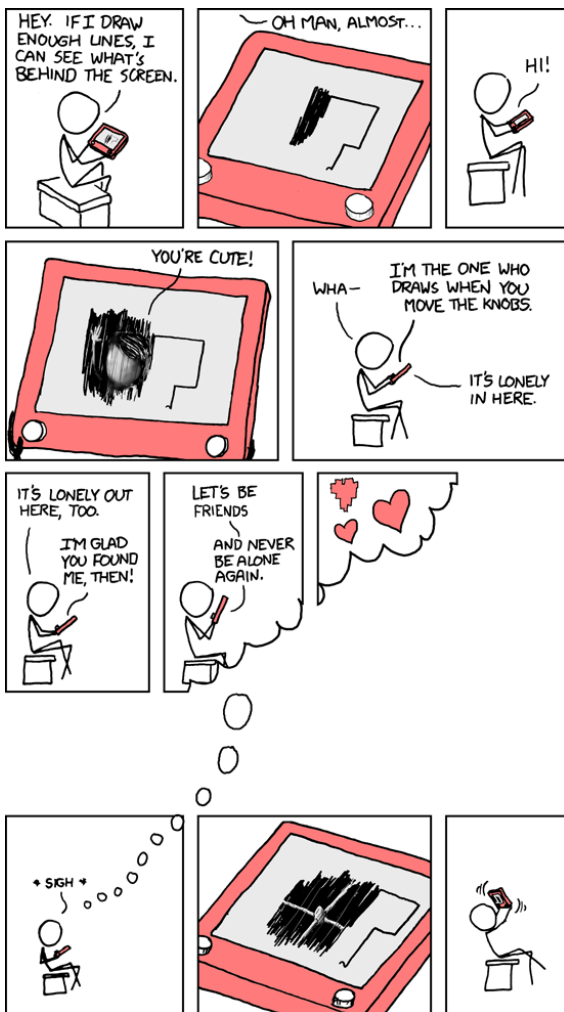
The reason Cueball chose to construct the sentence with so many memes is not clear. Since the comic lists "ruined life" as one of the cons of this scene, it would seem that the accident, as well as the subsequent use of memes, were not planned. It's possible that Cueball had too many memes in his head and couldn't think of anything

else to say amid the nervous tension. If this were another character, say Black Hat, then it would be easier to believe that the entire night could have been staged just to give him an opportunity to use the sentence and set a record.

The title text references 4chan, a site known for its memes, trolls and other assorted Internet clutter, and sarcastically implies that any advice they might give would in any way be at all helpful. Due to its population of trolls and other unhelpful sorts, advice given by 4chan would normally be useless at best and actively detrimental at worst; however, the title text implies that Cueball regrets that he did not ask 4chan for advice, and maybe have used them for this earlier.

#551: Etch-a-Sketch

March 04, 2009



Explanation

Cueball notices that if you draw a lot on an Etch-a-Sketch, the aluminum powder in it can be cleared from enough of the screen to allow a view of the interior (as seen here).

Cueball then proceeds to clear a window into the device, which shows him that there's a girl, Megan, inside whose job is to act as the stylus for the Etch-a-Sketch. She suggest that they be friends, and little hearts pop up.

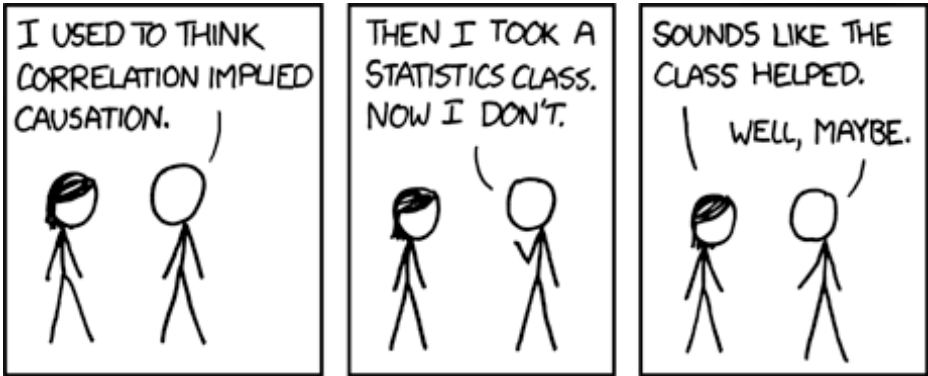
As the dream fades, it then becomes clear that this is just a fantasy, and Cueball sighs at the rather more mundane reality that the lines get drawn by a stylus moving on a simple arrangement of rods. The comic ends with Cueball shaking the Etch-a-Sketch, likely in resignation at the reality of it, which resets it and will re-conceal the mechanism.

Another possible explanation is that Cueball is lonely and craving companionship, enough to envision someone living inside his Etch-a-Sketch. This is demonstrated by the hearts in the eighth panel, and Megan's line: "Let's be friends, and never be alone again." When his fantasy ends, he sighs sadly before becoming frustrated and shaking it.

The title text notes that sometimes the mysteries surrounding us turn out to be much more boring than we dream they are.

#552: Correlation

March 06, 2009



Correlation doesn't imply causation, but it does waggle its eyebrows suggestively and gesture furtively while mouthing 'look over there'.

Explanation

This comic focuses on the apparent difficulty people have in understanding the difference between correlation and causation. When two variables (like blood cholesterol levels and heart disease) are positively correlated, it means that as one variable increases so does the other, whereas a negative correlation means that as one variable increases, the other decreases. The human brain is very good at seeing patterns and deducing rules, and the seemingly natural conclusion is that the one is leading to the other. In the example, that high blood cholesterol causes heart disease. This may well be true. The positive correlation is certainly not an argument against such a conclusion. But it is only one type of evidence and is certainly not proof.

The relationship between diet and blood chemistry and heart disease is a complex one, but simpler examples abound. For example, if you tallied the sales of sunglasses and incidence of skin cancer by region, you would probably find that there is a high positive correlation. That is, in locations where many people buy sunglasses, there are also many cases of skin cancer. Here it would seem silly to believe that wearing sunglasses can cause skin cancer, but this is exactly the same thinking that allowed us to conclude that blood cholesterol causes heart disease. Correlations do have the ability to mislead us. In this example, both sunglasses and skin cancer are directly affected by a third factor (specifically, a climate where many people expose themselves to the sun). In

essence, when two variables are correlated it does not provide evidence that one variable has caused the other. All it says is that their trends move in relation to each other. The correlation could be due to causality, but it could equally be due to other factors, or it could even be a random result.

In this situation Cueball is explaining to Megan his realization that correlation is not the same thing as causation. He further explains that his belief changed some time after taking a statistics class. Megan, concludes that the course caused his realization thereby establishing a causation. Cueball's final response of "Well, maybe." is a self-referential joke as there is not enough information to establish causation, only correlation which the class supposedly would have taught him. Being taught something in an academic setting does not necessarily mean a person will readily understand/realize the concept, hence the lack of absolute causation. It could also be a joke on Megan's behalf. Cueball may know whether his new knowledge is caused by the course, but he points out that Megan can't be certain about the causation.

The title text plays on two meanings of the word imply: have as consequence, or insinuate. In the statement correlation does not imply causation, correlation is here seen as a person, giving you subtle hints where to look for the cause. This is a metaphor for research, where the correlation must be investigated further, perhaps in a wider scope or with the consideration of more variables, so that the reason for it is understood. For example, Barry

Marshall and Robin Warren noticed that the presence of *Helicobacter pylori* was highly correlated with duodenal ulcer patients. They investigated further. Result: the Nobel Prize in Medicine.

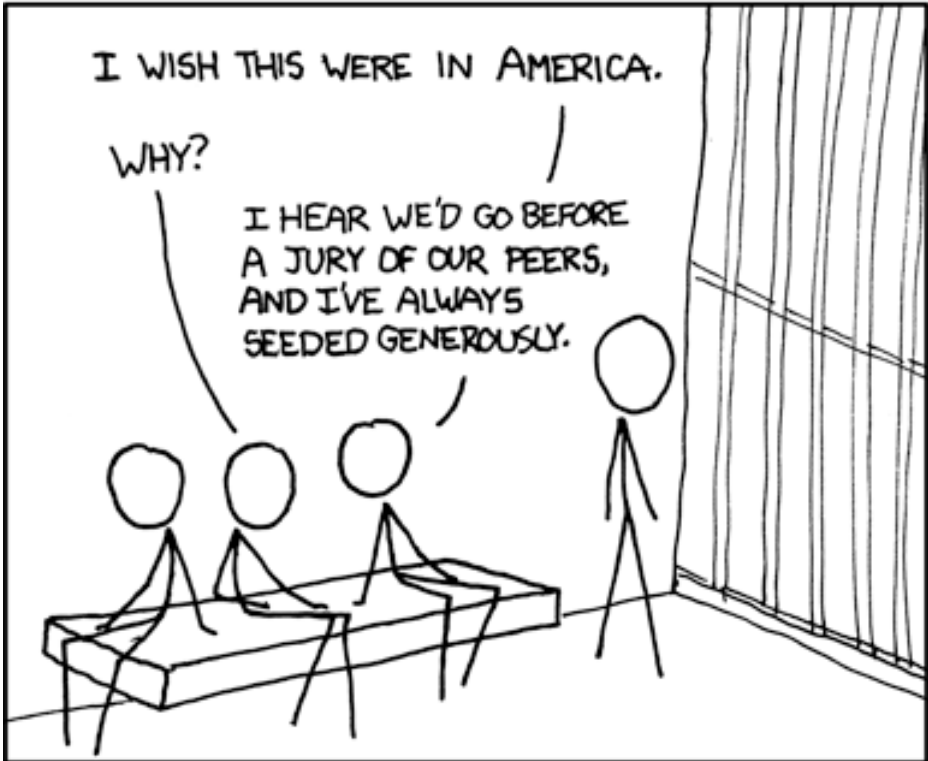
In addition, the title text's reference to waggling eyebrows and gesturing furtively while mouthing "look over there" is possibly a reference to the movie *Ferris Bueller's Day Off*, in which the character of Cameron Frye tries to alert Ferris that Ferris's father is in the next cab over, and they are about to be discovered ditching school. What Randall is saying with this reference is that Correlation (if it were a character in a movie) is desperately trying to draw attention to Causation without openly stating this intention, and perhaps that correlation is a good place to start when looking for causation.

At the end, Megan suggests that "the class helped" (which is a causation), but Cueball is not sold, exactly because correlation (taking the class and improved understanding of causation versus correlation) does not imply causation (taking the class leads to improved understanding).

#553: Pirate Bay

March 09, 2009

AWAITING THE JUDGES' RULING AT THE PIRATE BAY TRIAL:



We find you guilty of closing your torrents as soon as they finish. Your sentence is unremovable Hungarian subtitles on everything.

Explanation

The Pirate Bay is a website dedicated to facilitating BitTorrent downloads of popular media. The site's servers were taken down, briefly, and the operators were taken to court in Sweden, back in 2009.

Unlike normal downloads, files downloaded via BitTorrent are not stored on any web server, but instead transferred in small pieces by other people torrenting the same file; these other people are called "peers." BitTorrent allows websites to provide downloads without using up disk space or bandwidth serving up the entire file; instead, they can host smaller torrent files, which simply describe what the finished file should look like and a few "tracker" servers where lists of other peers can be found, and the peers themselves handle all of the bandwidth issues. This approach is used by a number of websites for completely legal downloads (it's popular among smaller game companies providing digital downloads, for instance), but it's mainly associated with piracy.

However, BitTorrent depends on peers actually having the file blocks that you need. People who have already downloaded the entire file, but continue to connect to the network solely to provide that file to others, are called "seeders," and they are an essential part of a healthy torrent. General etiquette demands that people should continue to seed a file until the ratio of data uploaded to data downloaded exceeds 1, although many people feel that one's ratio should be much higher. In any case,

closing your torrents as soon as they finish, as mentioned in the title-text, is extremely bad etiquette, so it is punished with nuisance subtitles. This punishment was likely chosen because finding correct and well timed subtitles, in whatever language, for a pirated show tends to be quite hard sometimes.

This comic is essentially a pun on this second meaning of the word "peer" - in the US court system, a "jury of your peers" means a jury composed of everyday people like you, while the Pirate Bay operators interpret it to mean a jury composed of people who they've shared files with in the past. The Cueball that does the talking, and thus is the protagonist of the comic, feels that his approach would give him lenience in the trial, since he has always seeded well, thus ensured those peers had a good downloading experience.

The title text shows what punishment this kind of peer group would make if they find you guilty - unremovable subtitles in Hungarian. Many pirated videos originate from countries where no dubbed version is available in the regional language, so the only way to understand what's being said is by applying subtitles. These videos are then uploaded with subtitles still included, causing consternation among downloaders who can understand the spoken words but not the subtitles. Annoying Hungarian subtitles are just an example for a language most people don't understand. Finnish, Czech, or Polish wouldn't be better.

#554: Not Enough Work

March 11, 2009

SIGNS YOUR CODERS DON'T
HAVE ENOUGH WORK TO DO:



It's even harder if you're an asshole who pronounces `<>` brackets.

Explanation

In some companies, programmers can find themselves under-employed. This may be because these companies have little programming work until something breaks or needs upgrading, or perhaps they are between projects, or simply waiting for a go-ahead. Coders still need to make themselves available to perform emergency fixes, but they may have no other assigned work. This requires them to find constructive ways to spend their time. Or unconstructive, if that is more fun.

Dvorak is a keyboard layout that was proposed in 1936 as an alternative to the existing, entrenched QWERTY layout, developed in the 1870s. The QWERTY keyboard is the standard in the US, but its key layout was not designed for (or against) speed, instead evolving organically over time to bend to the needs of Morse code receivers, to evade patents and to solve commonly encountered mechanical issues, while the DVORAK keyboard layout was made with typing efficiency in mind.

The Dvorak keyboard was ultimately unsuccessful. It persists today, but has never threatened the dominance of the QWERTY keyboard. Even if the Dvorak layout is more efficient (which is still a matter of debate, see the uncomfortable truth in 561: Well), QWERTY was and is the standard. This means that every keyboard user has to learn QWERTY anyway, and there is insufficient benefit in spending the time to learn a new layout, especially

when you would have to switch back and forth between Dvorak and QWERTY as the situation demands.

Therefore, even seriously considering the switch is a sign that you have nothing better to do. Another joke is that even though the coder has plenty of spare time on his hands to practice on Dvorak, he has only been able to 'almost' match his old typing speed.

This was the first comic to refer to Dvorak, but since then it has become a recurrent theme on xkcd. A later comic, 1445: Efficiency, mentions, in the title text, how you could waste lots of time testing to see if Dvorak is faster.

Gopher is a defunct internet protocol, which has been completely superseded by HTTP. It's a perfect example of the kind of thing a programmer might implement in the absence of other, more useful work. (As an aside, the protocol is named for Goldy Gopher, the mascot of the University of Minnesota, where it was developed. But, for the sake of most people who used it across the larger pre-web internet, it may have mostly evoked the essence of the term "gofer"/to go for something.)

HTML and XHTML are markup languages used to describe web documents. XHTML-strict is a more restricted version of HTML that excludes certain redundant tags like `<center>`, which is theoretically no longer necessary now that `<div>` and `` exist. Haiku, on the other hand, is a kind of Japanese poetry. Rather than having a rhyming meter like Western poetry,

Japanese poetry has restrictions on syllable count; a haiku must contain three lines, containing 5, 7, and 5 syllables, respectively. The section of code given is HTML markup, and would be read by a web developer like this:

Which can be divided in syllables like this:

This meets the syllable requirements. Restricting yourself to writing markup in this form would be extremely challenging, time-consuming and pointless, so it, too, is a good sign that coders need more real work to do. The title text notes that if you are one of those assholes that are pronouncing the angle brackets, then it would be even harder to write HTML in Haiku format. "Left angle bracket" and "right angle bracket" take up five syllables each on their own. (The asshole part is Randall's opinion about those who do pronounce `<>`). Haiku was mentioned later in 622: Haiku Proof.

Finally, the last panel mentions the biggest timesink of them all: webcomics! [This is probably self-referential.] (Or, even worse, wikis devoted to explaining the jokes in CERTAIN webcomics.)

#555: Two Mirrors

March 13, 2009



If you actually do this, what really happens is Douglas Hofstadter appears and talks to you for eight hours about strange loops.

Explanation

In folklore, Bloody Mary is a legendary ghost or spirit conjured to reveal the future. She is said to appear in a mirror when her name is called multiple times (mainly 3). The Bloody Mary apparition may be benign or malevolent, depending on historic variations of the legend. The Bloody Mary appearances are mostly "witnessed" in teenage group participation games, often as part of a game of truth or dare. This is Bloody Mary's first appearance in xkcd, the second being 2364: Parity Conservation.

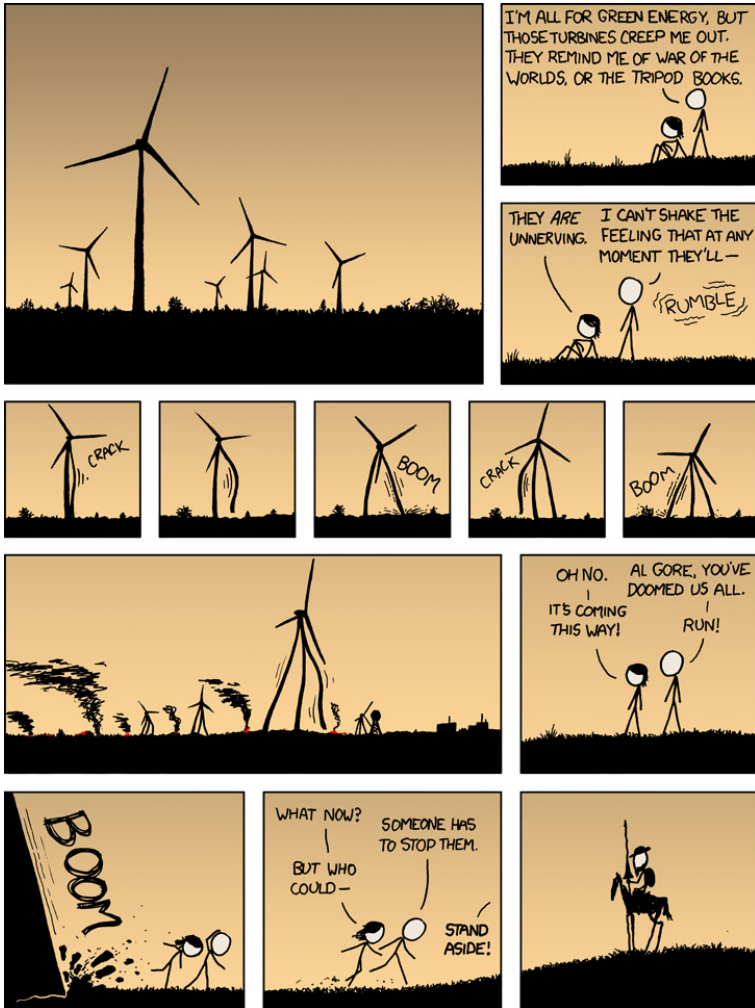
In this comic, Megan sets up two mirrors facing each other, in which reflections bounce back and forth between the mirrors until the mirrors absorb all the light. She then says "Bloody Mary" three times (as in the folklore) before ducking, conjuring an infinite number of spirits who jump from the mirror towards each other. It's not clear if they simply collide, or pass into the opposing mirror. Megan may be attempting an experiment either in particle physics upon colliding mirror matter or bridging Mirror Universes by enabling Bloody Mary's opposing characterizations to interact with each other, or both.

Douglas Hofstadter (also referenced in 917: Hofstadter) is the author of Gödel, Escher, Bach and I Am a Strange Loop. In the former book, among many other discussions of infinite loops, he points a television camera at the screen on which its image is projected,

forming an endless series of screens similar to panel 2 of this comic. In the latter book he focuses on the idea of minds being self-referential. "In the end, we are self-perceiving, self-inventing, locked-in mirages that are little miracles of self-reference". This blends with the idea of the images of the person looking in the mirror being reflected endlessly.

#556: Alternative Energy Revolution

March 16, 2009



The moment their arms spun freely in our air, they were doomed -- for Man has earned his right to hold this planet against all comers, by virtue of occasionally producing someone totally batshit insane.

Explanation

Megan and Cueball are looking at modern "windmills" (known as wind turbines) harnessing wind energy into electrical energy. They comment that there's something creepy about the windmills. They allude to the book *The War of the Worlds* by H. G. Wells (the Jeff Wayne musical version of *The War of the Worlds* has paintings of the Martian tripods somewhat like these turbines) and also to John Christopher's *Tripods* trilogy, a young adult series of books that is also about aliens who ride in walking tripods. Suddenly the windmills' pylons split into three legs, becoming the tripods suggested.

They exclaim that Al Gore has doomed us all. Gore is a former Vice President of the United States of America, known for his environmental activism and promotion of green energy sources, relevant because wind turbines like the ones here are one of the alternative energy sources he supports.

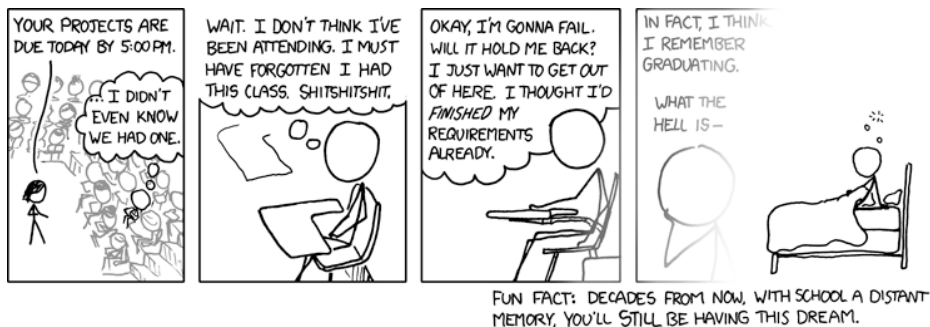
In the final panel, the seventeenth-century literary figure Don Quixote arrives. Randall's depiction seems to be inspired by the drawing by Pablo Picasso. In the original story, Don Quixote is a wandering knight of questionable sanity who fights a windmill, which he believes to be a giant. Hence, he is the appropriate person to deal with this threat. Wind turbines also appear in later comics. In 1119: *Undoing*, Randall still seems to dislike them. In 1378: *Turbine*, the turbine is alive as it is in this comic, though its talking may simply be

anthropomorphism.

The title is a joke on the phrase "Alternative Energy Revolution," which normally refers to replacing of harmful power sources with eco-friendly options. However, in this case, the Alternative Energy sources are literally rising up in a revolution against humanity, while their rotor blades are revolving. The title text is also a reference to *The War of the Worlds*: "But there are no bacteria in Mars... when I watched them they were irrevocably doomed... By the toll of a billion deaths man has bought his birthright of the earth, and it is his against all comers." Of course, this time we are only saved because we — in spite of having evolved — still produce insane members of our species: some of them occasionally being crazy in a practical way (as Don Quixote's special powers lie in defeating windmills).

#557: Students

March 18, 2009



The same goes for the one where you're wrestling the Green Ranger in the swimming pool full of Crisco. You guys all have that dream, right? It's not just me. Right?

Explanation

This was the first comic with one of Randall's fun facts.

Students often dream they have assignments they have forgotten about that are due in a very short time period, leaving no time to complete the assignment, thus filling them with the feeling of impending failure. The panic and helplessness of being unable to complete the work in time only subsides when the dreamer wakes from the nightmare, although sometimes they wake to a reality where there actually is a looming deadline.

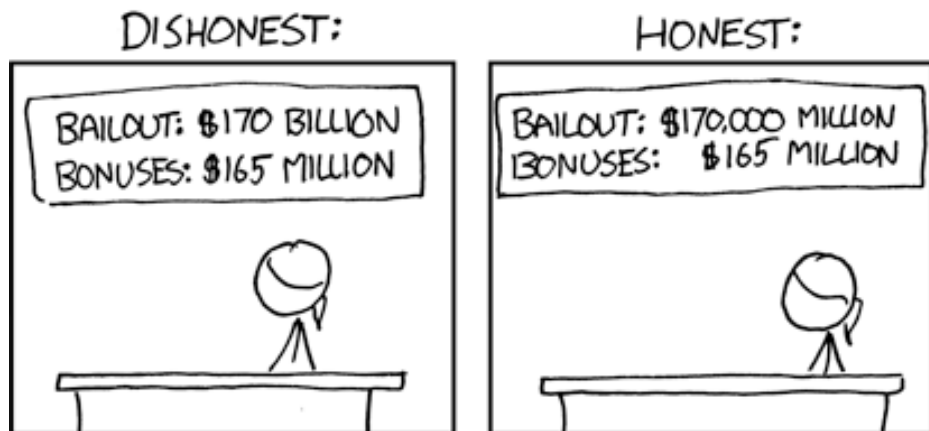
This comic suggests these dreams continue well after graduation, although there may be a nagging feeling that "I thought I completed everything and graduated".

The title text refers to the Green Ranger from the Mighty Morphin Power Rangers, or, indeed, any of the many Power Rangers/Super Sentai seasons with a green ranger. Crisco is a brand of vegetable shortening, a fat that is solid at room temperature and frequently used in baking. The joke is that Randall has a very odd recurring dream, and wants reassurance that he is not the only one... but he likely is!

Eleven years later, Megan tells Cueball that just the thought of being in a crowded classroom (even without concerns about an assignment) is scary enough in comic 2285: Recurring Nightmare. But that was due to the COVID-19 pandemic starting in 2020.

#558: 1000 Times

March 20, 2009



DEAR NEWS ORGANIZATIONS: STOP GIVING LARGE NUMBERS WITHOUT CONTEXT OR PROPER COMPARISON.

THE DIFFERENCE BETWEEN A MILLION AND A BILLION IS THE DIFFERENCE BETWEEN ME HAVING A SIP OF WINE AND 30 SECONDS WITH YOUR DAUGHTER, AND A BOTTLE OF GIN AND A NIGHT WITH HER.

And 0.002 dollars will NEVER equal 0.002 cents.

Explanation

When amounts of U.S. dollars (or other currencies of comparable size) in the millions, billions, or trillions are mentioned in conversation, the impression left by the cited number is not some specific amount, but rather some generically large amount of money. A billion is a thousand times larger than a million, but if one is not paying close attention, they both mentally register as being "very large" or "life-changing if they ended up in my bank account", rather than being as different as "one dollar" and "a thousand dollars" are.

In this comic, Randall notes how news organizations take advantage of this fact to make certain figures sound comparable, when they are actually not. The "Bailout" referred to is the 2008 Troubled Asset Relief Program (TARP), wherein money was cheaply loaned to large banks by the government to help them remain solvent. The "Bonuses" are the subsequent bonuses paid by those banks to their employees.

Citing the size of the bailout in billions and the size of the bonuses in millions gives the misleading impression that the bulk of the bailout was spent on bonuses - in particular to the very traders who caused the problem that cause the need for TARP in the first place - making for much more outrageous and therefore attention-grabbing story. While the news organizations are not lying per se, citing the figures using the same unit makes it clearer that the bonus payments were a tiny

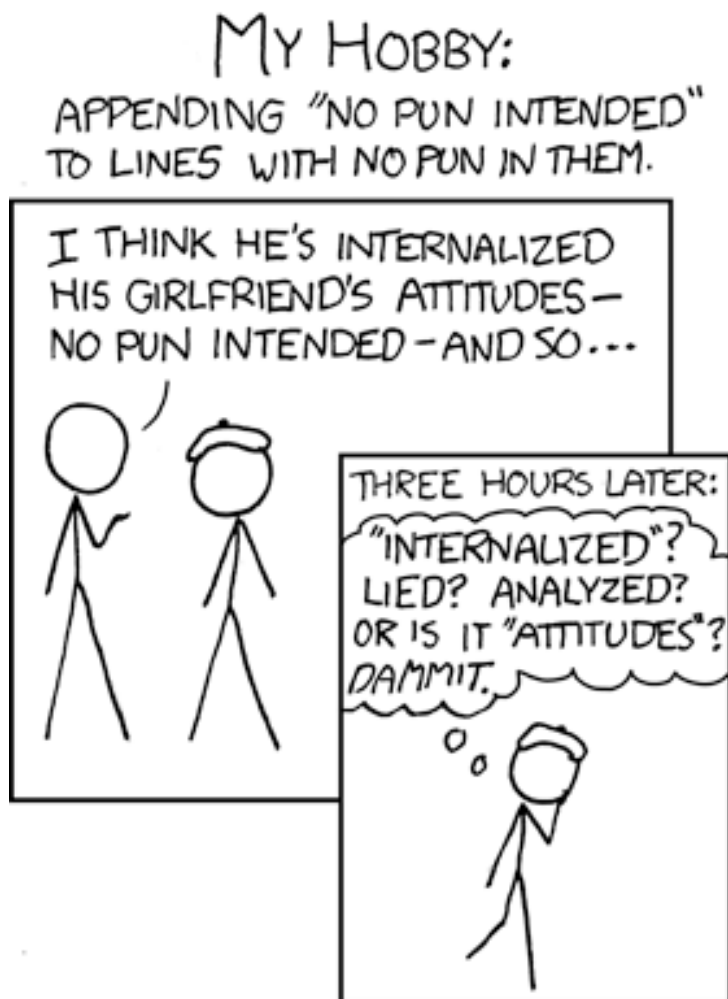
fraction of the bailout which is not as obviously outrageous. The news organizations, as news organizations are, were choosing the presentation that was most attention-grabbing over the presentation that conveys the information most accurately.

Below the two comic panels Randall asks the news organizations to stop using this way to misleadingly represent large numbers. He then proceeds to compare the difference between a million and a billion using an analogue that a newscaster may understand. Proportionally speaking, if a million is like Randall taking a sip of wine and spending 30 seconds (presumably talking over the wine) with your daughter, then a billion would be like him drinking a bottle of Gin and spending a night with her (presumably having drunken sex with her). Note that a billion is 1000 million, and 1000 times 30 seconds does indeed equal 8 hours and 20 minutes, or about "one night". And a bottle of gin (750 mL, 40% ABV) contains 1000 times as much alcohol as a small sip of wine (3 mL, 10% ABV)

The title text is a reference to a semi-famous case where Verizon Wireless quoted a rate of 0.002¢ (which equals \$0.00002) per kB on their data plan, but charged \$0.002. They could not see the difference.

#559: No Pun Intended

March 23, 2009



Like spelling 'dammit' correctly -- with two m's -- it's a troll that works best on the most literate.

Explanation

"No pun intended" is an idiom meaning that something just said wasn't meant to be a pun, implying that the preceding statement could be interpreted as one. As done in the comic, following a non-pun with "no pun intended", although factually accurate, breaks this implication and confuses listeners who will be trying to work out which part of the sentence could have been interpreted as a pun. This could be a form of Nerd Sniping, similarly to 2032: Word Puzzles

In this comic, which is part of the My Hobby series, Cueball uses this tactic to confuse Beret Guy, who spends the next three hours trying to understand what pun there could have been in Cueball's sentence: I think he's internalized his girlfriend's attitudes. The guy Cueball talks about seems to have taken over (internalized) all his girlfriend's attitudes, values, standards and opinions, putting these instead of those he has from his own identity or sense of self. This is probably sad, but there is no pun in the sentence.

Beret Guy, however, has been fooled by the addition of no pun intended and tries to overanalyze the sentence - did Cueball mean Lied when saying Internalized or was it Analyzed or even Attitudes he meant; could that be the pun? Since there was no pun, he will never find a solution. This was Cueball's plan all along.

It seems like Beret Guy, after three hours, finally gives up

when he says Dammit. This then leads to the title text joke.

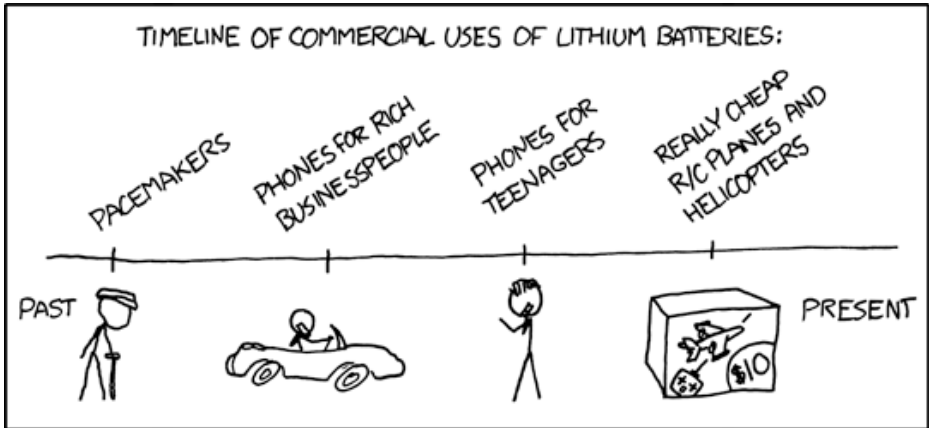
Unfortunately for the hobbyist, blank puns default to sexual innuendos, the most notorious example being "If You Know What I Mean."

The title text elicits a similar confused reaction, as the most literate people will be more likely to want to spell out "damn it" rather than using the also correct abbreviated form with morphed spelling, dammit, which is referred to as with two m's because many people (mainly in the US it seems) contract damn it to damnit, which is the "wrong way".

This way of confusing people and messing with their brains is normally an action done by Black Hat, xkcd's resident classhole. The reason Cueball is shown is probably because Randall uses Cueball to represent himself.

#560: Lithium Batteries

March 25, 2009



LIFE WOULD BE SO MUCH BETTER IF I WERE
ONE OF THOSE PEOPLE WHO AGED BACKWARD.

I'm normally a pretty frugal person, but I still compulsively buy any R/C aircraft that's less than \$30. In the last few years, this has become a problem.

Explanation

Randall muses that his life would have been better if he aged in reverse; this idea is based on a timeline of the usage of lithium-ion batteries. The reasoning is that each of these uses would come to realization when he most needed it; cheap RC planes as a child, a cellphone when he is a teenager and also later for when he is a successful businessman and finally a pacemaker when he is old.

The time-reversed aging is probably a direct reference to "The Curious Case of Benjamin Button", by F. Scott Fitzgerald, a film of which was released in December 2008, a few months before this comic appeared. Randall has used this theme before in 270: Merlin, referencing another backward-time-traveling character (in that case, from "The Once and Future King" by T. H. White).

Lithium-ion batteries have the highest energy density of any widely available battery, and for this reason are commonly used in portable electronic devices such as laptops, tablets and smartphones, and also the newest airliners such as the Boeing 787 Dreamliner.

In the title text, Randall states that he is a big fan of cheap radio-controlled aircraft (now powered by cheap lithium-ion batteries), which he most likely wishes would have been available when he was a child. That these have now become so cheap has undoubtedly been the inspiration for this comic.

As such, he has an uncontrollable, instinctive urge to make up for his childhood lack of RC aircraft by buying every one he sees compulsively, if they cost less than \$30, in spite of him normally being a frugal person. (Frugality has been defined as the tendency to acquire goods and services in a restrained manner). This tendency has now become a financial problem since cheap RC aircraft have become more and more plentiful, whereas if Randall aged backwards, this wouldn't be an issue - as children rarely make purchases, and adult Randall would live in a world where RCs were still expensive. The one in the comic is priced at only \$10.

The concept of experiencing events in reverse is also explored in 1869: Positive and Negative Reviews.

#561: Well

March 27, 2009



I'll concede ergonomics anecdotally, but none of the studies of Dvorak were at all rigorous (the most-cited Navy study was overseen by Dvorak himself). And the 'slow typists down' thing is a myth. Also **EMACS RULES VI**
DROOLS WOOOOOOOO!

Explanation

This is the first comic in the Well series. It was followed by 568: Well 2.

Uncomfortable truths are truths that exist, but no one wants to have to think about them.

The first is about *Firefly*, the TV series created by Joss Whedon and canceled by FOX, due to poor ratings performance, after airing the first 13 episodes out-of-order. In *Firefly*, the main languages spoken are English and Chinese (supposedly in equal measure), because China was the only other world power besides America to go to space (Joss Whedon's own explanation on the DVDs). However, there are very few actual Asians on-screen.

The second is about two different keyboard layouts, QWERTY and Dvorak. Early typewriters used to jam easily if two nearby keys were struck at about the same time. To work around this, the QWERTY layout, named after the first six letters on its keys, scattered common letter combinations around the keyboard, thus greatly avoiding the problem. Later typewriter mechanisms were less prone to jamming, which prompted a few people to try to create alternative layouts, such as Blickensderfer's DHIATENSOR layout in 1892, or the Dvorak Simplified Keyboard in 1932. Such layouts never really caught on; by then, typists were all very used to the QWERTY layout, and were unwilling to take the time

and effort to learn a new one.

In the Dvorak layout, August Dvorak placed the most frequently used keys at the most easily accessible places; Dvorak's advocates claim this reduces typing effort and repetitive strain (as mentioned in the title text) while increasing typing speed and accuracy. However, rigorous, unbiased studies have yet to clearly show significant superiority. (As the title text mentions, the most commonly cited study in Dvorak's favor was overseen by Dvorak himself during his US Navy service in World War II.)

This was the second comic to refer to Dvorak after 554: Not Enough Work, and since then it has become a recurrent theme on xkcd.

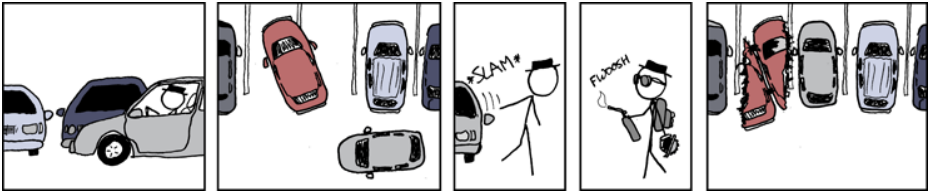
The third and fourth truths are connected: they involve the two people receiving them and (presumably) their relationship with each other. Every time Cueball said "I love you" he never really meant it; whereas Megan meant it every time she said "I love you". This is very uncomfortable for both! This could also be intentional, since in 568: Well 2, a person called Mike (who happens to be a friend of Megan), is actually hiding inside the well and tells these uncomfortable "truths", he would have intentionally broken Cueball and Megan up to be able to manipulate Megan in the next installment.

The title text perpetuates the Emacs vs. vi debate. Both Emacs and Vim are text editors that are frequently used as general-language editors of source code. The issue is

that, while Emacs is more user-friendly and customizable, vim is more lightweight while needing few keystrokes in text editing. Because of this balance, fans of Emacs and fans of vim end up fighting each other.

#562: Parking

March 30, 2009



Police reported three dozen cheerful bystanders, yet no one claims to have seen who did it.

Explanation

There are few things so annoying as finding, when a parking lot is full, that someone has parked so carelessly as to take up two spaces. Even worse, it may have been intentional; they decided to exchange the risk of someone accidentally scratching their car for the risk of someone doing it on purpose, see 1030: Keyed. However, there are also non-violent ways to tackle the problem;[citation needed] politely leave a note, or (if possible) just move their car (whether to its proper alignment or to an impound lot).

Of course, Black Hat takes the road less traveled, apparently involving a cutting torch and what looks to be a circular saw. The offending portion of the parked car is sliced off (entirely without surgical precision) and neatly slotted into the remainder of the space. It is now legally parked, but will never become a functional car again.[citation needed] But at least Black Hat finally has space for his own car!

This comic may be the one referenced in 496: Secretary: Part 3, where it is shown that Black Hat '...completely disassembled a car' because 'It was parked across two spaces! It was only fair', or this is the second time that a car has been in the way of him parking, so he has taken matters into his own hands.

The title text indicates that a large crowd watched Black Hat at work but refused to identify him, presumably

because they feel that the car owner got what he deserved.

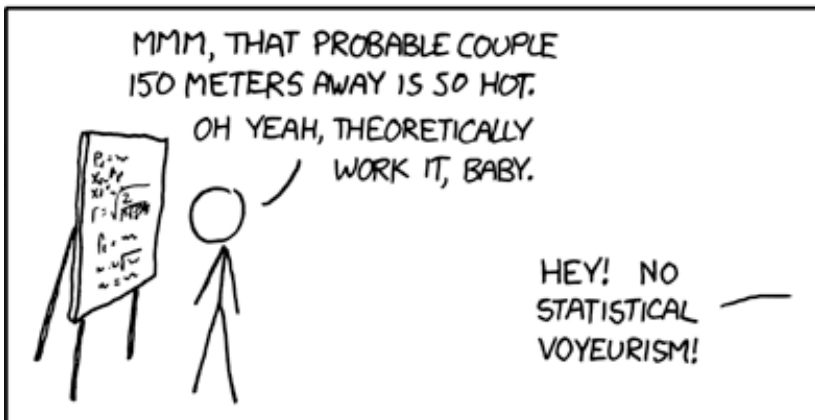
#563: Fermirotica

April 01, 2009

P_d REGIONAL POPULATION DENSITY (e.g. 18,600/mi²)
 X_f AVERAGE PERSON'S FREQUENCY OF SEX (e.g. 80/YEAR)
 X_d AVERAGE DURATION OF SEX (e.g. 30 MINUTES)

$$r = \sqrt{\frac{2}{\pi P_d X_f X_d}}$$

ON AVERAGE, SOMEONE WITHIN
DISTANCE r OF YOU IS HAVING SEX.



I love how Google handles dimensional analysis. Stats are ballpark and vary wildly by time of day and whether your mom is in town.

Explanation

Fermi problems are a type of estimation problem involving several quantities that are not to be measured but that can be estimated to within an order of magnitude to be inserted into equations relating the quantities to produce an estimate for a target quantity accurate to within an order of magnitude, based upon the assumption that overestimations and underestimations of the magnitude of the input quantities will compensate for each other in the resulting estimated quantity. Erotica is material meant to cause sexual arousal in a person. "Fermirotica", then, is erotica made from the solving of a Fermi problem.

In the comic, Cueball is solving the Fermi problem of finding the average distance from the observer wherein a couple can be found copulating. (The example parameters given in the comic yield 139 metres.) The implication of the equation is that we are surrounded by sex in our everyday lives and that this is arousing to Cueball.

Nevertheless, we rarely encounter couples during the act itself.[citation needed] In this way, the comic may also be referencing the Fermi paradox in that the calculation suggests that the observer is highly likely to be surrounded by copulation but, paradoxically, never observes it. This is similar to the Fermi paradox which suggests that extraterrestrial life (i.e. space aliens) should be commonplace in our universe yet humanity has yet to

discover the presence of extraterrestrial life. Of course, the lack of empirical evidence of couples having sex can easily be explained by the fact that most couples only have intercourse in privacy. By the same token, the original problem may be explained thusly: Alien species might conceal themselves from our observations, e.g. in order to avoid interfering in the development of civilizations. This answer to the Fermi Paradox is commonly called zoo hypothesis.

The second panel has Cueball sexually aroused by imagining the intercourse that has been determined to be statistically nearby. This manner of arousal is termed statistical voyeurism by an off-frame speaker who is evidently upset by it. Possible reasons for being upset are that he considers it an inappropriate use of statistics, or finds voyeurism inappropriate in general, or because it accurately predicts an actual copulation he is aware of and would rather keep private (e.g. the off-frame speaker is actually about to have sex).

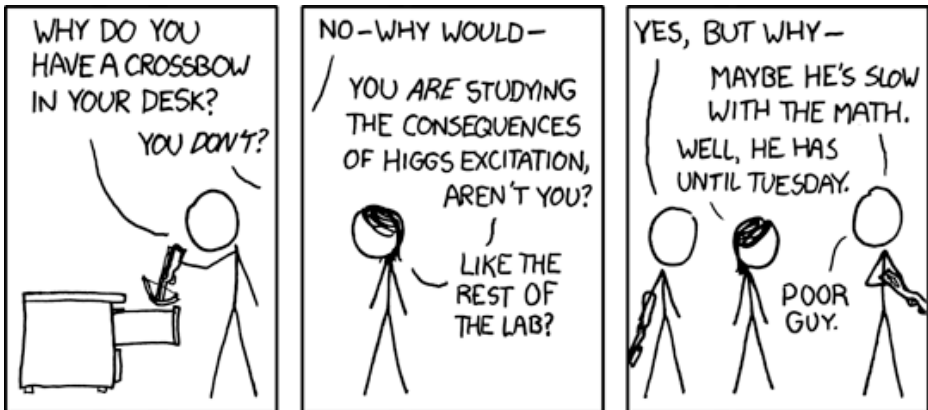
The title text refers to the Google calculator and praises its capabilities of dimensional analysis, and more specifically unit conversion. Randall assumes that most readers will enter the equation with the example parameters into the Google search engine. The built-in calculator will output the result in the correct SI unit metre, although the population density was given as people per square mile. The second part of the title text states that the examples are nothing more than an educated guess, and that the equation is simplified. In reality, more parameters must be taken into account, e.g.

the time of day, since most people will have sex in the evening or night. The insulting[citation needed] suggestion that the probability of sex rises when the reader's (supposedly promiscuous) mother is in town represents a Yo Mama joke.

Note that this comic was released on April 1st without being an April Fools' Day comic. But Randall made another April Fool on his reader, see the trivia section.

#564: Crossbows

April 03, 2009



I hate being the slowest guy in the lab.

Explanation

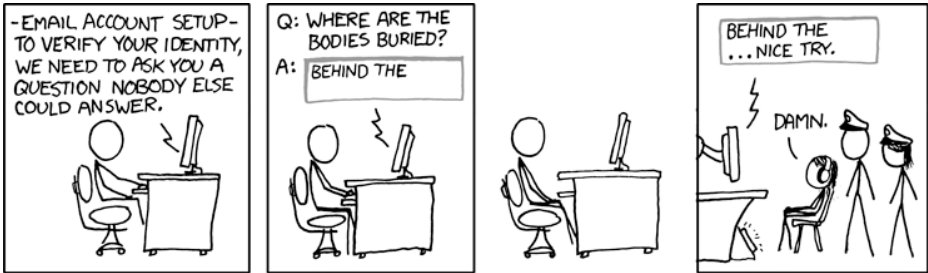
There are conflicting theories as to the meaning of this comic.

In the first and second interpretations, the title text could refer to literally being the slowest in the lab, and therefore the least able to outrun whatever is making everyone carry crossbows.

The proper interpretation of this comic, or whether there even is one, remains an open question.

#565: Security Question

April 06, 2009



Let's invite him to a party and play 'I never'. Okay, I never hid any bodies **SOUTH** of Main Street. ... he's taking a drink!

Explanation

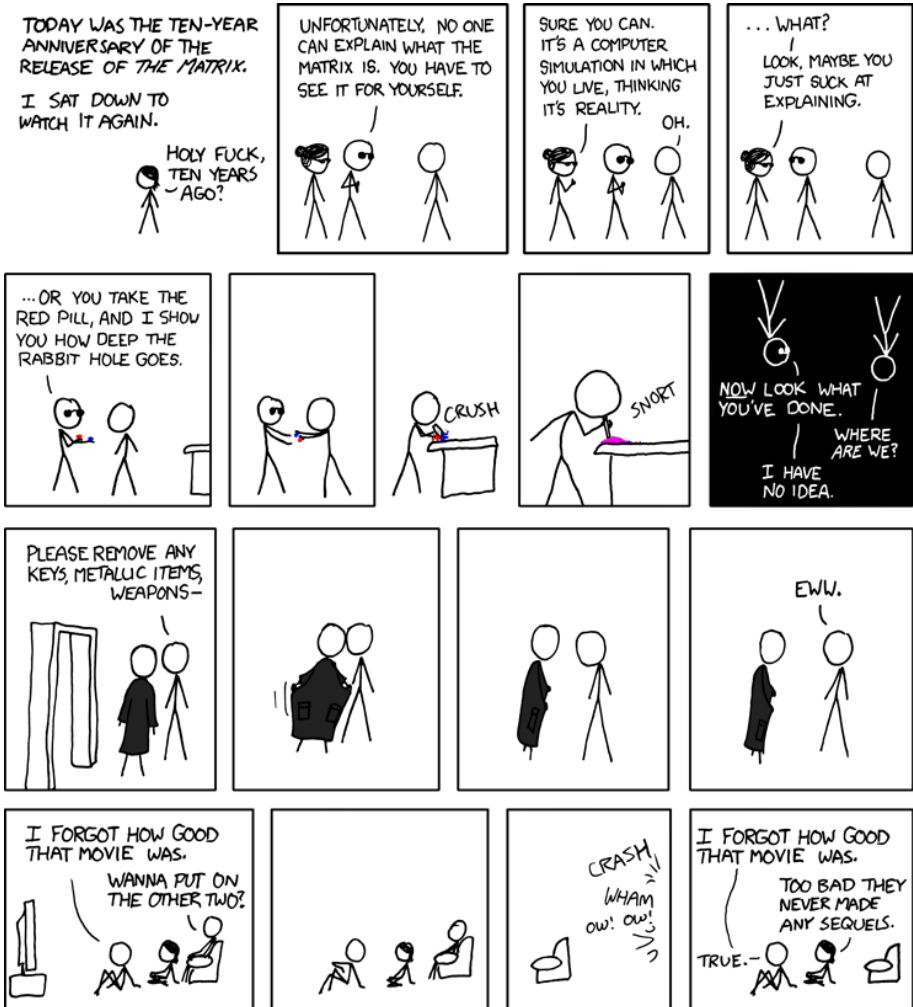
Security questions are sensitive questions that allow a user to retrieve or reset his password if the password is lost or stolen. Because of this powerful function, security questions should be treated just as seriously as passwords. Typical security questions include "What's your mother's maiden name?" or "What's your secondary school?" and are intended to be easy for the user to answer but hard for anyone else to answer.

In this comic, however, the security question is deployed in a strange way, as the question "Where are the bodies buried?" assumes that one had buried bodies, hence had killed someone. The question turns out to be a ploy by the police, who were trying to bait Cueball into confessing his crime, as well as revealing the location of the incriminating evidence.

"I never" is a drinking game that somebody says "I never did something" to the others. If you never did it, you don't need to drink, otherwise, drink. Since he takes a drink for "I never hid any bodies SOUTH of Main Street", the police have narrowed down the search area. The next statement in the game could be "I never hid any bodies WEST of Central Avenue" (or whatever road dividing the area), further localizing the bodies to a quarter of the original search area, in a Twenty Questions manner. Of course, by taking the drink Cueball also admits that he buried bodies, though this evidence would not likely be accepted by any court.[citation needed]

#566: Matrix Revisited

April 08, 2009



I actually remember being entertained by both the sequels while in the theater. They just don't hold up nearly as well in later comparison.

Explanation

This comic was drawn in celebration of the ten-year anniversary of the movie *The Matrix*. (Despite the claims of the first panel, the movie was actually released on 31 March 1999 in the US, although it was next released in Australia on 8 April 1999.)

Megan is shocked when she realizes it is already ten years ago that *The Matrix* came out. This is an effect Randall has used to make you feel old several times (for instance he mentions *The Matrix* again two years later in 891: *Movie Ages*.)

In *The Matrix*, almost all of humanity lives in a computer simulation. Many years ago, robots took over the real world (not the simulation), and placed humans into the simulation while their body heat generated power for the robots. A few people have escaped from the Matrix, and they are on a mission with others to free the human race from the robots. The title of the strip is a reference to the documentary on the filming of *The Matrix*: *The Matrix Revisited*.

In the first three rows of the comic we see three famous scenes from *The Matrix* parodied by Randall. The characters are Morpheus, with sunglasses; Neo, as Cueball in the first two scenes and with a black coat in the third scene; Trinity, as Hairbun; and a security guard in the third scene, as another Cueball-like guy.

In the first scene Morpheus tells Neo that one cannot explain what the Matrix is and that he must see it for himself to understand. Morpheus is very mysterious as he tempts Neo to take a look himself, which, in the movie, leads to the next scene. In this comic, however, Trinity makes Morpheus look foolish by clearly explaining the Matrix in a single, simple phrase, and then telling him that he must suck at explaining. (The actual quote from the movie is no one can be told what the Matrix is, which makes more sense: even after being rescued from the Matrix, Neo at first refuses to accept that his entire life has been a simulation, becoming highly distraught when confronted with that truth. Morpheus later mentions that for this reason, it is unusual to rescue people past a certain age.)

In the next scene Morpheus (ignoring Trinity's remark, or in a separate rerun of the interaction) has reached the part of the scene where he shows Neo two pills, one red and one blue, and tells Neo that he can either take the blue pill and return to the simulation (the Matrix), never to hear about the Matrix again, or he can take the red pill and leave the Matrix, and "see how deep the rabbit hole goes" (a reference to Alice in Wonderland). In the movie, Neo takes the red pill. In the comic, however, he mixes the two pills then snorts the purple powder he has created as though it was an illegal drug such as cocaine, and apparently winds up in a bizarre upside down and inverted dimension, presumably caused by his 'Drug Trip'. Even Morpheus now has no idea where they are. Note that the inversion of both color and orientation

could be intended to evoke the idea of capturing an image on film (i.e. a film negative), which is really the only place where Neo and Morpheus exist. It is possible that the combination of pills allowed Neo to break through another layer of the simulation. Alternatively, this could simply be Randall trying to explain that they are in an alternate dimension whilst still remaining within the constraints of stick figures on white and black backgrounds.

The third scene is at the point that Neo and Trinity must save Morpheus, who has been captured by agents of the simulation. They obtain many guns and much ammunition, holstering and clipping a large amount of their stock beneath trenchcoats (the remainder in large canvas bags that they carry). We are shown the point at which Neo is stopped at a security checkpoint in a building in the Matrix. A security arch has shown him to have metal on his person, typically indicative of having inadvertently taken keys through the gateway rather than sending them through the luggage scanner (which has not yet shown the bag contents). A security guard tells him to remove any metallic items (such as the keys) and place them in a container in order to walk again through the scanner, cleanly. In the movie, he opens his trenchcoat to revealing his myriad of weapons, surprising the previously unwary guard, and then (with the assistance of Trinity) proceeds to dispatch all of the outclassed and outgunned guards that are present or arrive in immediate response. In the comic, Neo also opens his trenchcoat, but the guard's response of "eww"

implies that Neo may instead be mostly naked underneath and the guard is disgusted by him flashing his genitals.

Back in the real world, after watching the movie, Cueball turns to his friends (Megan and another Cueball-like guy) and exclaims that he had forgotten how great the movie is. When his friend suggests that they put on the other two sequels, there is a beat panel where Megan and Cueball look at each other, then they beat up the offender off-panel.

The two sequels to *The Matrix* are widely regarded as inferior to the original, with some fans pretending they don't exist. This is what happens when Megan and Cueball return, and Cueball repeats his statement about how good it was. Then Megan is saddened by the fact they never made any sequels and Cueball agrees, having tried hard (even violently) to forget those sequels. In the title text, however, Randall disagrees with the characters in the comics, remarking that he enjoyed the films when he watched them in the movie theater, but agrees that they are not as good as the original.

On IMDb the original movie was still in the top 20 on their top 250 chart in December 2023, with an average of 8.7 vs. only 7.2 and 6.7 to the sequels (though even those two scores are relatively high compared to other action titles).

#567: Urgent Mission

April 10, 2009



WE WERE GOING TO USE THE TIME MACHINE TO PREVENT THE ROBOT APOCALYPSE, BUT THE GUY WHO BUILT IT WAS AN ELECTRICAL ENGINEER.

Sure, we could stop dictators and pandemics, but we could also make the signs on every damn diagram make sense.

Explanation

Benjamin Franklin was one of the Founding Fathers of the United States. Aside from uniting most of his country against Great Britain's rule, he was also a model of a renaissance man: an author, painter, musician, politician, postmaster, inventor, scientist, and diplomat. Some of his legacies include bifocals, the Franklin stove, an odometer for a horse-drawn carriage, the almanac, and abolitionist ideals. He has since been honored with the use of his image on the \$100 bill.

Franklin also did several experiments regarding electricity, and invented the lightning rod. He discovered the fundamentals of electricity, including positive and negative charges, as well as the principle of conservation of charge. When Franklin first wrote down his notes for electricity, he defined a positive charge as one left on a glass rod by rubbing it with silk, and a negative charge as one left on rubber by rubbing it with fur. Without realizing it, this meant that he had assigned a negative value to the charge on the electron, later identified as the fundamental carrier of electrical charge.

In an electrical circuit, we envisage the charge to be flowing from positive to negative. This is analogous to energy flowing from a region of high temperature to one of low temperature, or a fluid moving from an area of high pressure to one of low pressure. However, because an electron is negatively charged, the actual flow of electrons is in the opposite direction, from negative to

positive. This reversal of the natural expectation has caused unnecessary confusion to many fledgling engineers.

In the comic, the invention of a time machine was commissioned with the intent of preventing a robot apocalypse like in Terminator movies, a recurring theme on xkcd. However, the Cueball that built and used the machine is an electrical engineer with misplaced priorities, believing that reversing Franklin's "mistake" takes precedence over eliminating a more immediate threat to the human race.

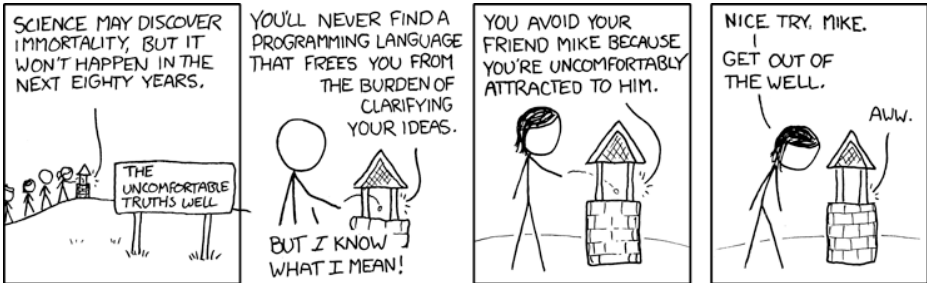
Cueball tells Franklin that the charge left on a glass rod by rubbing it with silk should be the negative charge, not the positive charge, because the friction removes charge-carrying electrons from the rod. This would not have been intuitive to Franklin, because the electron had not as of yet been discovered. Yet by telling Franklin to reverse the positive and negative conventions, this would ultimately result in an alternate universe where electrons are assigned a positive charge. One can only speculate what other changes this reversal of convention would lead to, as small changes tend to cascade into huge ones. Would the positron have been instead named the negatron? And would this affect the success of the Transformers franchise?

In the title text, Cueball defends his actions, stating that preventing the rise of dictators or pandemics is a fine idea, but here they have a chance of making the signs on "every damn diagram" make sense, which to him seems so

much more important. Cueball is likely voicing Randall's frustration with this breach of logic, albeit exaggerated to comedic levels.

#568: Well 2

April 13, 2009



But I've made **\$13.72** already today! Ow, stop throwing pennies.

Explanation

This is the second comic in the Well series: The first was 561: Well.

The average person's lifespan is 80 years now. So, while immortality may become a reality within the coming century, Ponytail won't live long enough to achieve it.

Cueball is looking for a programming language that does not need him to be specific about his ideas. When humans communicate ideas to other humans they may be vague but still understood, since the listener can infer a lot of detail from context and basic knowledge. Until we start 'raising' compilers (like you would a child) compilers will not possess that feature. Hence the need for the programmer to be exact in communicating his ideas to the compiler. No language will ever be able to change that. Cueball complains that he knows what he means, perhaps hoping that this is perfectly sufficient.

Finally we find out that one of Megan's admirers, Mike, whom she avoids, is hiding in the well. He has been waiting for her to come for her uncomfortable truth, so he can make her believe that she is actually attracted to him. But she is not so easily fooled and calls his bluff, telling him to come out of the well.

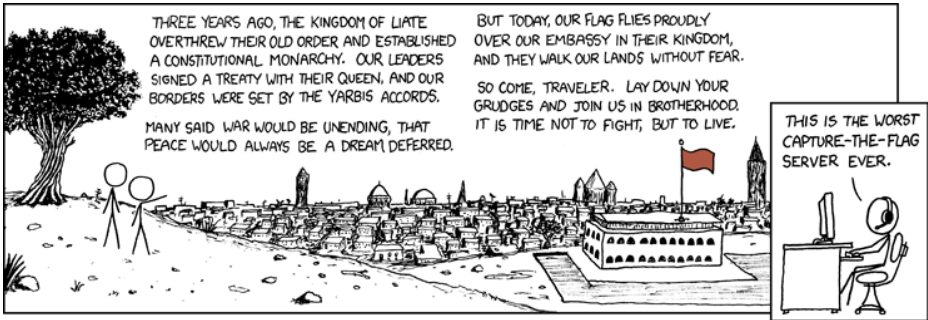
The title text suggests he might also have been down there for the money everyone is throwing in to the well to get this uncomfortable truth. So it has never been

a working well. When everyone (or just Megan) finds out about this, Mike is bombarded with the all the pennies people have brought along.

In the comic game 1608: Hoverboard there is also a well in the left part of the world. This well has the same type of covered top and at the bottom (it is very deep) there is a girl and above her a coin, like the one thrown into a wishing well. On these links, to images on xkcd ; used in the game, the top and the bottom of the well can be seen.

#569: Borders

April 15, 2009



Eventually a **UN** is set up. And then a lone rebel runs down the line of flags in front of it, runs back to his base, and gets a kajillion points.

Explanation

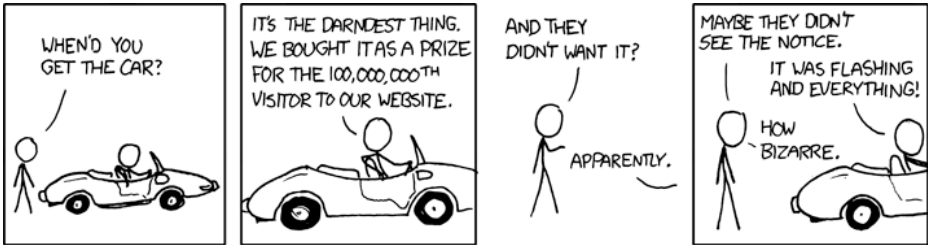
Capture the flag (CTF) is a common way of playing games where the objective is to capture the opponent's flag while protecting your own team's flag. This comic describes a CTF server that Cueball joins for an online war game which has the basic plot premise that after the bloodshed of the overthrow of the kingdom's old order, and its signing of peace accords with the leader's of the narrator's realm, peace has become a reality, and not just a dream unendingly deferred. Therefore, no one is trying to capture the opponent's flag, which according to the storyline flies over the kingdom's embassy in the narrator's country, as to ensure peace, therefore making the game unexciting and pointless, as Cueball says in the last panel.

The name "Liate" may be a reference to the LIATE rule for integration by parts.

The title text refers to the line of flags in front of UN buildings, which includes the flag of almost every country internationally recognized. If such an organisation and therefore a collection of flags of all the teams were established on the server, which seems the logical conclusion of the goal of achieving peace, one could get a very high score by rebelling against their nation and quickly capturing all of the opposing flags, getting a kajillion points, which is slang for "an unspecified large number."

#570: New Car

April 17, 2009



Somewhere out there is a company that has actually figured out how to enlarge penises, and it's helpless to reach potential customers.

Explanation

Cueball is sitting in a nice sports car, and his (Cueball-like) friend asks when he got it. It turns out it was bought as a prize supposed to be delivered to the 100,000,000th visitor to his company's website. But the user did not react to the notice on the page about the award, even though it was flashing.

A well-known type of Internet scam tries to trick the reader into thinking that they've won a prize, often in the form of an annoying flashy ad banner (e.g. `<script>alert("YOU'RE THE 100,000,000th CUSTOMER! YOU WON A FREE FERRARI!");</script>`). A typical clickbait.

Cueball did have a fancy car to give out, but the winner didn't claim it, believing it to be a scam. It is a bit like the boy who cried wolf — given enough lies, the truth will eventually look like a lie.

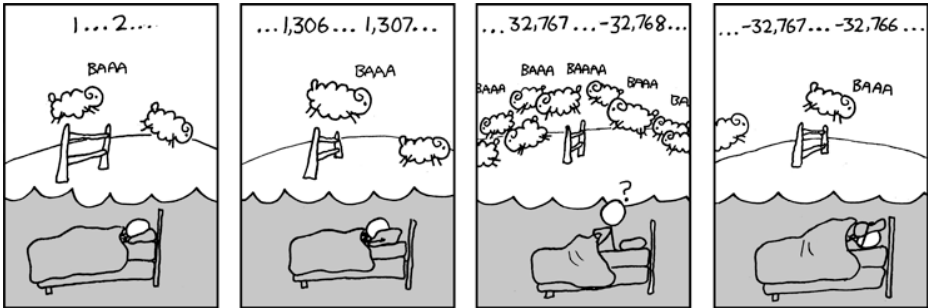
(As coincidences would have it, the same joke appears in the much-loved British comedy series *That Mitchell and Webb Look*, in a 2006 John Finnemore sketch about a "MASSIVE YACHT!" giveaway. Presumably, Randall hadn't come across the Mitchell and Webb version when he wrote this comic three years later.)

The title text refers to another type of scam: advertising fake "male enhancement" drugs. Randall suggests that if such a drug did exist, it would be complicated to

advertise effectively, since most people would assume it was a scam. Additionally, there may be a relation implied (intersection) between people having sports cars and people needing penis enlargements: big cars to compensate for feelings of inferiority[citation needed] (or red cars to pay for cyanness).

#571: Can't Sleep

April 20, 2009



If androids someday **DO** dream of electric sheep, don't forget to declare `sheepCount` as a long int.

Explanation

Cueball is in bed and is having trouble sleeping. He tries the old standby of counting sheep as they jump over a fence, but upon reaching 32,767 sheep, 65535 sheep jump back over the fence and start counting up again from -32,768. This is a reference to an integer overflow, when an increasing amount (sheep in this case) suddenly overflows and shows up as a negative value. This is because when a whole number or integer is represented in a digital form, such as on a computer, the number's range is limited by the amount of space used to store it. When the greatest possible number given the storage space is exceeded, an arithmetic overflow occurs, which may result (depending on the used language among other things) in starting over at the least possible number given the storage space, similar to a car's odometer. Imagine an odometer with six digits reaching 999999. Upon driving one more mile or km, the digits will roll back over to 000000. Causing or failing to prevent integer overflow is a common mistake by programmers that may have software security consequences. Some languages like C/C++ even leaves the signed integer overflow undefined behavior, it may or may not wrap to the beginning, the instruction can be ignored or may cause the software to crash.

In this case, the least and greatest possible numbers are -32,768 and 32,767, which implies that Cueball's brain would only be 16-bit. In addition, it's clear that the number is designated as a signed number, meaning that it

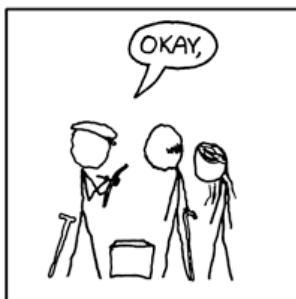
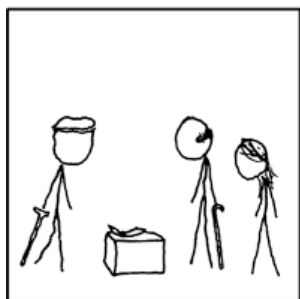
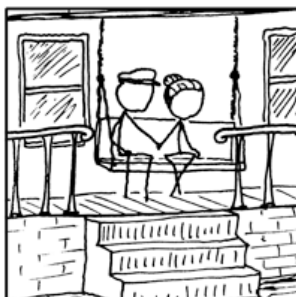
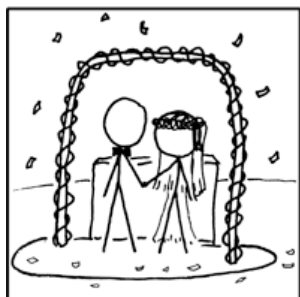
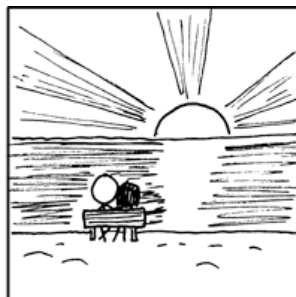
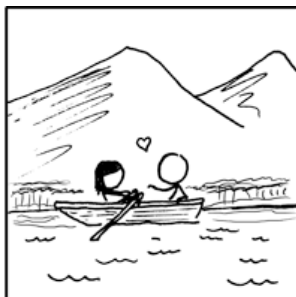
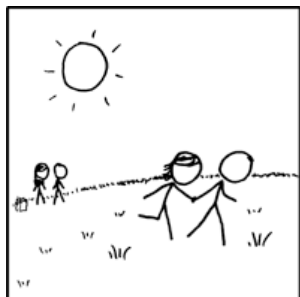
can be either positive or negative.

However, even if Cueball had this limitation, it would never actually pose a problem. By 32,767 sheep, at a rate of one sheep per second, Cueball has been counting for 9.101 hours (or about 9 hours 6 minutes). This would signify that he has extreme insomnia and probably needs treatment, and also that he has spent the entire night counting, and therefore would just get up and start the day rather than count sheep all over again from -32,768.

The title text refers to the 1968 Philip K. Dick science fiction novel *Do Androids Dream of Electric Sheep?*, which was adapted into the perhaps more widely known Ridley Scott directed 1982 film *Blade Runner*. The implication is that if we ever do create androids that dream of electric sheep, we should make sure to give them sufficient storage space to store numbers large enough such that an arithmetic overflow will be far less likely to occur, even if they count for a long time. A "long int" depends on machine architecture, but it typically consists of four bytes rather than two, so instead of being limited to a range from -32,768 to 32,767 the number will be capable of storing numbers from -2,147,483,648 to 2,147,483,647, which would take 68.1 years to exhaust (at the rate of 1 sheep/sec). "sheepCount" is a possible name for a variable to be used in a computer program. Declaring a variable tells the computer that it should allocate a portion of memory to be associated with the variable name given. No spaces are used because variables cannot contain spaces, for a reason that would take a little too long to properly explain here.

#572: Together

April 22, 2009



This scavenger hunt is getting boring. Let's go work on the treehouse!

Explanation

Cueball and Megan are seen running together hand in hand. Behind them, two others (who look like Cueball and Megan as well) are standing next to a box in an open field of grass.

Together, Cueball and Megan fall in love, get married, and retire in old age to a porch swing, Cueball now wearing a sailor cap and Megan with hair worn just like Hairbun.

Suddenly, without a word, Old Cueball using his cane, leaves old Megan on the porch, even though she shouts out for him to come back. He then returns to his two friends at the box from the first panel, they are now also much older and are still standing beside the box. Old Cueball picks up a sheet of paper and checks off "Happiness", the third point checked off on a list entitled "Scavenger Hunt," where the other items include these two above that are checked off: Indian-Head Penny and Snake Skin, as well as the two items below that, are not yet checked off: Four-Leaf Clover and Shark Tooth. At least one more unchecked point is on the list, but it is covered by a speech bubble.

So finding happiness was just one item in what is presumably the longest-running scavenger hunt of all-time, considering Cueball grew significantly old during the hunt. The comic ends with Cueball asking, "What's next?"

The list indicates this is a hunt for somewhat rare items. The US Indian Head cent (penny) was produced from 1859 to 1909, making it somewhat rare. But this they have managed. (It may have been easier to find when the scavenger hunt started, depending on when that was; for instance, if the last panel takes place in the 2000s, and 70 years have gone by, then the treasure hunt started in the 1930s, when these pennies were still fairly common.) Also, the snake skin has been managed which may be a little easier to find if you live in areas with snakes as they shed their skin by molting. So finding such a skin would be the objective to find here.

A four leaf clover is a rare variation of the common three-leaf clover. A shark tooth is not easy to obtain unless you live near a beach with souvenir shops.

The title, Together, of the comic is probably a reference to the saying that you find happiness together with your loved one. Cueball could have taken many different paths to find happiness, together or separate, but he chose togetherness as a way to find happiness, which is a common theme in love stories. But happiness is not something a person finds, it is an experience, hence the need to accumulate enough experiences to determine beyond doubt that happiness was truly found. This is why he had to wait until old age before he could go back to his friends.

Note that Megan is never seen together with Cueball's friends, and especially since she is not invited to go back to them to check the happiness point off, there there is

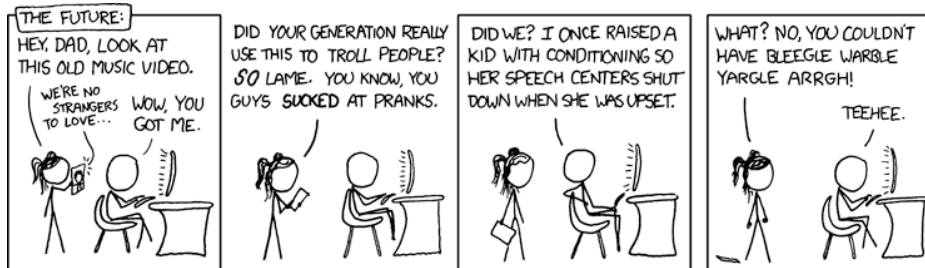
no reason to assume that she was in on the game from the beginning. She was just a means to an end, which makes Cueball's actions rather cruel and questionable.

The title text indicates that after all this time, the players may abandon the game due to being bored with it. It is typical for children to tire of a game before it is finished; except here, Cueball spent nearly a lifetime on just one part of this game! Building a treehouse is another example of a common childhood activity. Naturally, the intended mental image of a bunch of old men and women building a treehouse and playing in it like six-year-olds is another punchline. However, as mentioned in 212: Brain, the fantasy of constructing the perfect treehouse seems to nevertheless hold a permanent place in Randall's heart (or brain) regardless of how old he gets or how immature the ambition may seem. The idea of adults having a fort in the woods was also mentioned, rather darkly, in the title text of 219: Blanket Fort.

Three of the old people look very similar to three of those standing in line in 586: Mission to Culture. And much later in 1910: Sky Spotters the two birdwatchers look very much like the old version of Cueball and Megan. Giving an old person a sailor cap was also used in 2213: How Old.

#573: Parental Trolling

April 24, 2009



They'll pick music and culture that they know annoys you. Building in behavioral easter eggs is a fair retaliation!

Explanation

Set in the future, a daughter approaches her father playing a music video of Rick Astley's "Never Gonna Give You Up". The daughter insults her father's generation's versions of playing pranks, specifically Rickrolling. The daughter refers to this as "trolling" (part of the comics title), which is popular jargon for trying to disrupt a person or community via an action to elicit an emotional response. She then comments that Cueball's generation's trolling efforts suck.

The humor is in that the dad reveals he has 'trolled' his daughter by creating a reaction in which her speech centers would shut down when she gets upset, thus eliciting an emotional response which perfectly displays his prank. This would not be possible in real life unless he messed with her brain, which would be dangerous[citation needed] and possibly illegal. This could also be referring to how most people tend to get confused in their speech patterns when upset, meaning that the dad could in fact be trolling his daughter through her misunderstanding.

In this comic, the girl holds an ultra-thin tablet, a futuristic technology when this comic was released, a year before the release of the iPad. It also shows a curved computer monitor and keyboard, both of which seem to float above the desk.

The title text refers to the conflict between teenagers and

adults over music and culture, with teenagers often listening to music which annoys their parents. 'Easter egg' is a term used to describe a hidden inside joke or feature inside software. Here, the daughter has been treated like a piece of software by her father Cueball. He states that since the kids on purpose chooses music and culture that they know annoys their parents, it is a fair retaliation to build in such Easter egg responses. Many people would probably disagree on this, but maybe not so much parents with teenagers at home.

#574: Swine Flu

April 27, 2009

TWITTER IS GREAT FOR WATCHING
UNINFORMED PANICS UNFOLD LIVE.

twitter

REALTIME RESULTS FOR SWINE FLU

0.05

1,918 MORE RESULTS SINCE YOU STARTED SEARCHING. [REFRESH](#) TO SEE.



[SKEEVE37](#): OH GOD I ATE PORK YESTERDAY BEFORE
I KNEW ABOUT SWINE FLU!

LESS THAN 10 SECONDS AGO FROM WEB • [REPLY](#) • [VIEW TWEET](#)



[HANNELDREEC](#): WITHOUT DUCT TAPE I CAN'T SEAL THE
DOOR TO KEEP OUT SWINE FLU BUT I CAN'T GET
DUCT TAPE WITHOUT GOING OUTSIDE! HELP!

LESS THAN 10 SECONDS AGO FROM WEB • [REPLY](#) • [VIEW TWEET](#)



[PAULYSHOREFAN](#): HOW LONG UNTIL THE SWINE FLU
REACHES ME HERE IN MADAGASCAR?

LESS THAN 10 SECONDS AGO FROM WEB • [REPLY](#) • [VIEW TWEET](#)



[CRACKMONKEY74](#): SWINE FLU IS GOD'S PUNISHMENT
FOR THE ACLU AND LESBIANS AND 9/11 AND NANOBOTS!

LESS THAN 10 SECONDS AGO FROM WEB • [REPLY](#) • [VIEW TWEET](#)



[TWILIGHT7531](#): I FELL DOWN THE STAIRS AND THERE
WAS A CRACK AND A JAGGED WHITE THING IS STICKING
OUT OF MY ARM GUYS IS THIS SWINE FLU?

LESS THAN 10 SECONDS AGO FROM TWITTERIFIC • [REPLY](#) • [VIEW TWEET](#)



[WIGU](#): [@UNTOWARD](#) NO, THAT SOUNDS LIKE SYPHILIS,
NOT SWINE FLU. WHAT DID YOU SAY YOU DID
WITH A PIG?

LESS THAN 10 SECONDS AGO FROM TWEETDECK • [REPLY](#) • [VIEW TWEET](#)



[2011SENIORSRULE](#): MY DAD SAID FLU VACCINES ARE
LINKED TO AUTISM, SO TO BE SAFE FROM SWINE
FLU I'M TRYING TO LICK AN AUTISTIC KID.

LESS THAN 10 SECONDS AGO FROM WEB • [REPLY](#) • [VIEW TWEET](#)

Bad flu epidemics can hit young adults hardest because they provoke their powerful immune systems into overreaction, so to stay healthy spend the next few weeks drunk and sleep-deprived to keep yours suppressed.

Explanation

Swine flu is a strain of the flu which can be transmitted from pigs to humans. In 2009, it was the origin of the Pandemic H1N1/09 virus, which most news stations called either "H1N1" (the subtype name) or "swine flu". Because of the ambiguous name given to it and the somewhat hazy description of the transmittal process and dangers to humans, many people were concerned about the virus in ways that weren't going to be threats. This comic pokes a bit of fun at the overreaction by users on Twitter (rebranded as "X", in July 2023, long after this comic).

Randall (or someone else) seems to have created Twitter accounts for all referenced handles (that may not have already existed). Some of the handles continue their interactions with each other in later tweets.

Skeeve37 is a self-described hypochondriac. The tweet exemplifies the general populace's over-concern with the "animal themed" pandemics. Similarly after the bird flu scare, people avoided eating chicken.

Hanneloreec is a self-described "young lady who is concerned about many things". She is a reoccurring character in the webcomic Questionable Content by Jeph Jacques, who also manages her twitter handle.

Paulyshorefan's tweet is a reference to the flash game "Pandemic 2", in which players try to create a disease that

infects the whole world. Madagascar is the most difficult country to infect, as it only has 1 port and often closes it at the slightest hint of an infection. The difficulty of infecting Madagascar has caused it to become a meme. The user's Twitter handle is a reference to Pauly Shore, a comedian who was briefly popular in the 1990s before quickly becoming out of favor and derided as unfunny.

CrackMonkey74's tweet is a parody of viral Christian(?) messages that say that current tragedies are God's punishment, despite the fact that the Bible says that the end is not yet to come. More specifically, Crackmonkey74 blames the ACLU, lesbians (a reference to the current culture wars that give big press towards proponents of same-sex marriage against fundamentalist Christians), 9/11 (the day when the Twin Towers fell, causing controversy on whether Muslim terrorists crashed their planes on the towers or whether the government staged this by purposefully demolishing the towers) and nanobots (possibly a reference towards the highly promising but still relatively not understood field of nanotechnology, plus another reference towards the phrase "playing God"). He is likely the same Crackmonkey74 from 406: Venting and 202: YouTube.

Twilight7531's tweet implies that she got a bone fracture which ended up protruding from her arm. However, she seems to lack medical knowledge, so she is worried that her fracture is actually swine flu (though how she can be typing with a broken arm is confusing).

Wigu's tweet is a reply towards Untoward's. Given the

context, Untoward seems to have "gotten intimate" with a pig (since syphilis is a venereal disease). Given the fact that Untoward got sick because of a pig, Untoward seems to have concluded that he got swine flu.

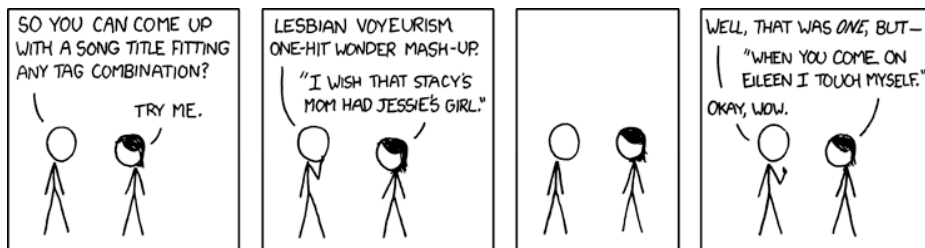
The last comment by 2011Seniorsrule references a medical paper published by the journal The Lancet, in which it is proposed that autism is caused by vaccination. Since then, the paper was partially retracted in 2004, and fully retracted in 2010 because of conflicts of interest. The entire incident has been defined as the MMR vaccine controversy. This stance has still been seen since the retraction of the paper, and still holds some popularity by cranks, quacks, pseudoscientists, and conspiracy theorists alike who are convinced that the CDC is hiding vital data that proves vaccines cause autism. The most famous figure in support of it is Jenny McCarthy. This Twitter user is not only using a debunked study about a completely different set of vaccines, they have also confused cause and effect (i.e. even if vaccines caused autism, that doesn't mean that autistic people carry flu vaccines). Also, licking vaccinated people isn't how vaccines are administered.[citation needed] On top of that, fear of germs and/or hypersensitivity is common among autistic people, so "licking an autistic kid" may be a difficult and possibly painful experience for the lickee. (By contrast, allistic children are well known to enjoy being licked.)[actual citation needed]

The title text at first states the fact that some flu symptoms are actually the symptoms of the body's

reaction, and can in some cases be more dramatic than the initial infection. E.g. A fever is a defense mechanism of the body against a disease. Then the title text makes the recommendation to protect oneself from an overreaction by living an unhealthy life. This is not good advice.[citation needed]

#575: Tag Combination

April 29, 2009



I love Eileen / and want you to love her / When you're
around / I'm one floor above her / If you could see / just
how much I adore her / Oh, that pretty red dress / I'd do
anything for her / (Too ra loo ra too ra loo rye ayy)

Explanation

Song tags are a form of file metadata used to categorize music. Tags will typically describe the content and genre of the song, and many music organization programs and services will allow users to find all songs that contain a particular tag; so when a user searches for "Country breakup music," they will receive a list of country songs about breaking up.

In this comic, Cueball tests Megan's claim that she can make a song name for any set of tags by coming up with a collection of mostly unrelated words: "lesbian voyeurism one-hit wonder mash-up." A lesbian is a woman who is only sexually interested in other women. Voyeurism is the act of watching someone else do something sexual, generally without their knowledge. A one-hit wonder is a band that had "one big hit" before fading from the public eye forever. A mash-up is when someone takes two previously unrelated songs and makes a third song that's a mix of both of them (a recent example of which would be this Gangnam Style/Ghostbusters theme mashup). In response, Megan immediately replies with one song title that looks like it would fit the tags well. When Cueball asks for a second example, Megan gives him a new example for the same set of tags, which is really impressive.

Megan's first title, "I Wish That Stacy's Mom Had Jessie's Girl" is a mash-up of "Jessie's Girl" by Rick Springfield (see video on YouTube), and "Stacy's Mom" by

Fountains of Wayne (see video on YouTube), the latter was a one-hit-wonder, whereas Springfield has had several other hits. (The song Stacy's Mom was referenced in comic 61: Stacey's Dad).

The second title, "When You Come on Eileen I Touch Myself" is a mash-up of "Come on Eileen" by Dexys Midnight Runners (see video on YouTube), and "I Touch Myself" by Divinyls (see video on YouTube). Both of these are one-hit wonders (at least in the US; Dexys had more hits in the UK). Note that "Come on, Eileen" means "Hurry up, Eileen", and that "to come on someone" means to ejaculate on someone. Since the song is about lesbian sex, come on someone must mean have an orgasm while being on someone.

For other random connections see 305: Rule 34.

Title text[edit]

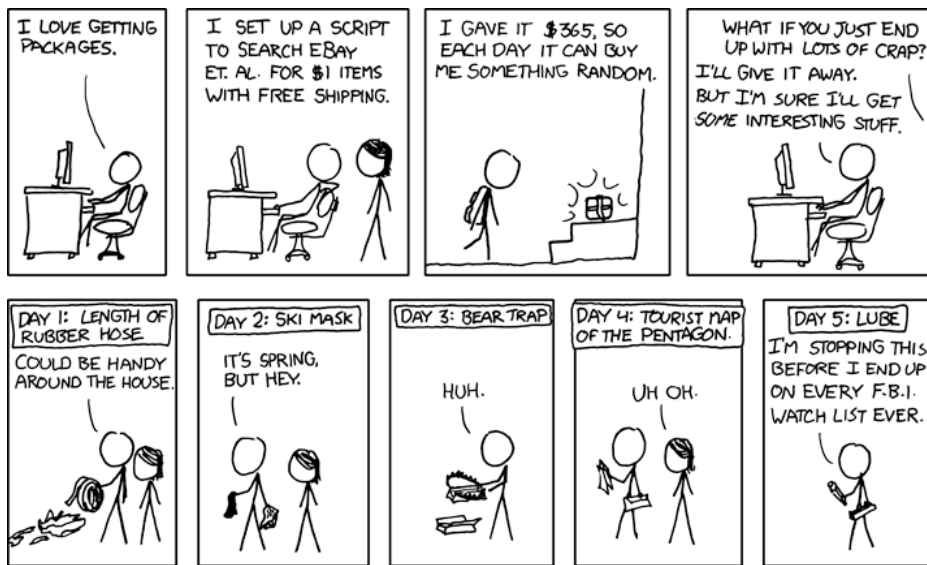
The title text is a set of potential lyrics to Megan's second title. Randall borrowed the rhyme scheme, phrasing, and subject matter from the first eight stanzas of "I Touch Myself" with additional subject matter inspired by "Come on Eileen." The final stanza is the chorus lead-in from the latter.

The lyrics suggest a changed relationship between the characters. In the original "I Touch Myself", the female singer touches herself (masturbates) when thinking about her lover (of unspecified gender); instead, she now does this while a new third character makes love to her beloved, Eileen, while the singer overhears them (as a voyeur) from the apartment above.

Here are the lyrics for I Touch Myself and Come on Eileen. Below in the table the mashed up lines are shown. As can be seen most of the text is from "I Touch Myself":

#576: Packages

May 01, 2009



Day six: 'The hell? Who mails a bobcat?'

Explanation

Cueball wrote a script that searches online shopping sites for items that cost US\$1 with free shipping. Because the script is programmed to use an account with a \$365 balance, this script will buy one random item per day for a full year. Megan comments that Cueball might just end up with "lots of crap" but he replies that he might get something interesting.

Over five days the script orders a length of rubber hose, a ski mask, a bear trap, a map of The Pentagon and "lube" (sexual lubrication). This pattern prompts Cueball to stop the script out of fear of being placed on a FBI watch list; to a paranoid passerby, the purchased items make Cueball look like a terrorist who plans to kidnap and torture federal employees. And also a pervert.

In the title text a sixth item is sent, a bobcat. This is a reference to 325: A-Minus-Minus where Black Hat delivered a bobcat instead of a chair.

#577: The Race: Part 1

May 04, 2009



Great, and you **JUST** finished paying off the settlement over the Wayne Coyne hamster ball incident.

Explanation

This is possibly a continuation of 139: I Have Owned Two Electric Skateboards. Firefly was a television series aired by Fox in 2002 that got cancelled mid-way through, but it has a large fan base nowadays (for a more comprehensive explanation, see the Wikipedia page). The star of the show was Captain Malcolm (or Mal) Reynolds, played by Nathan Fillion. So, in this comic, Megan tells Cueball that Nathan Fillion has an electric skateboard. Cueball immediately starts planning a trip to visit and race Nathan Fillion. Electric skateboards have been the subject of several other comics like 139: I Have Owned Two Electric Skateboards, 409: Electric Skateboard (Double Comic) and a panel in 442: xkcd Loves the Discovery Channel.

The title text refers to an earlier comic 211: Hamster Ball Heist, where Cueball kidnaps Wayne Coyne in his hamster ball.

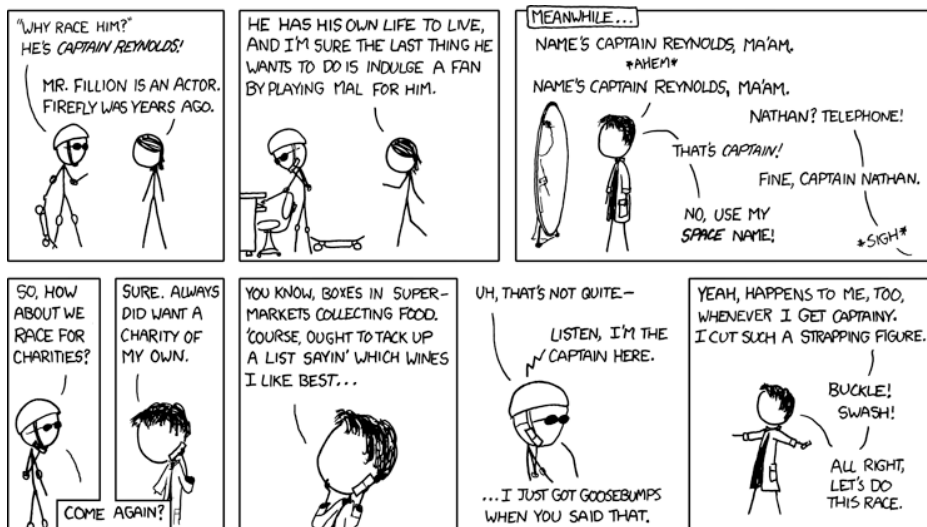
This series was released on five consecutive days (Monday to Friday) and not over the usual schedule of three comics a week. These are all the comics in The Race series:

- 577: The Race: Part 1
- 578: The Race: Part 2
- 579: The Race: Part 3
- 580: The Race: Part 4

- 581: The Race: Part 5

#578: The Race: Part 2

May 05, 2009



The Hammer + Captain Tightpants = Captain Hammerpants?

Explanation

Firefly was a television series aired by Fox in 2002. The star of the show was Captain Malcolm "Mal" Reynolds, played by Nathan Fillion. Megan tries to play the rational card, and insist that the characters of major TV shows must get tired of fans' never-ending need to see them playing that character, and never being themselves. Nathan Fillion, however, appears to miss the days of Firefly so much that he spends his time reenacting his role as Malcolm at home. In the fourth panel Cueball suggests they race for charities, which would mean the winner gets to donate the prize money to their charity of choice. In the fifth panel Fillion, takes the phrase and twists it to mean that the winner gets the charity. This is why Cueball says the confused line "Come again?"

Electric skateboards have been the subject of several other comics like 139: I Have Owned Two Electric Skateboards, 409: Electric Skateboard (Double Comic) and a panel in 442: xkcd Loves the Discovery Channel.

The title text refers both to Mal being referred to by Kaylee as "Captain Tightpants" in the episode "Shindig", and to Captain Hammer, a superhero played by Nathan Fillion in Dr. Horrible's Sing-Along Blog, another series created by Joss Whedon. "Hammerpants" may also be a reference to the odd, puffy parachute pants worn by 1990s rapper MC Hammer.

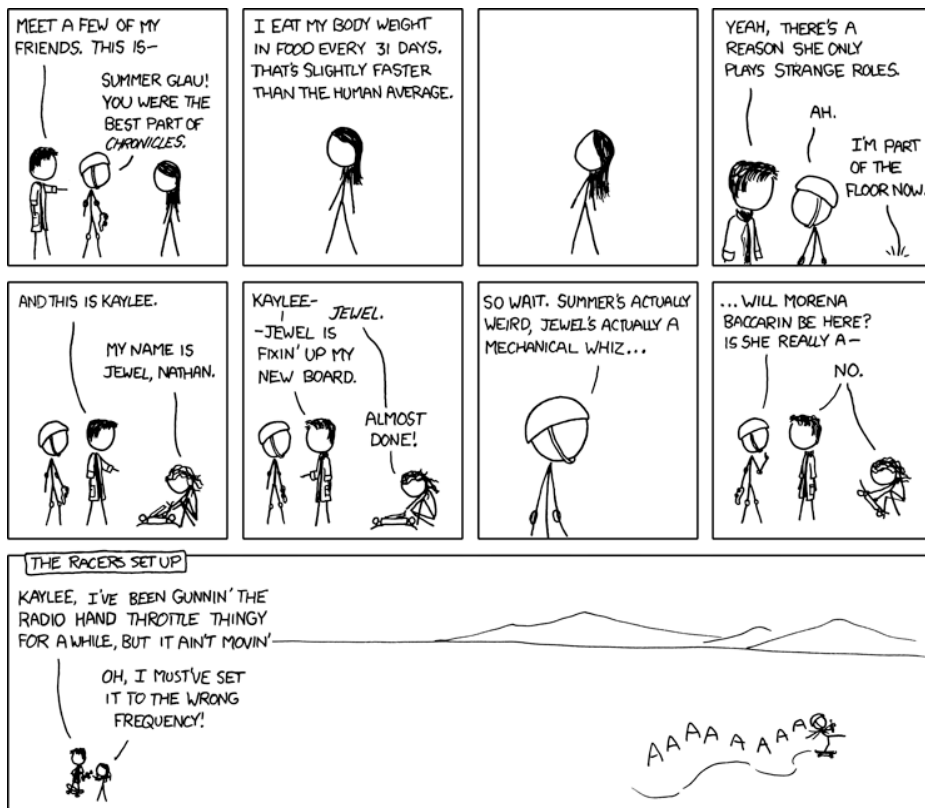
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- 580: The Race: Part 4
- 581: The Race: Part 5

#579: The Race: Part 3

May 06, 2009



No, the best things about The Sarah Connor Chronicles were: (1) watching Sarah and Cameron try to pass for normal, and (2) Cameron throwing people and things through walls. Everything else was pretty secondary.

Explanation

Firefly was a television series aired by Fox in 2002 that got cancelled midway through, but it has a large fan base nowadays. The star of the show was Captain Malcolm (or Mal) Reynolds, played by Nathan Fillion. Other members of his crew were Kaylee (played by Jewel Staite), the ship's mechanic, Inara Serra (played by Morena Baccarin) was a Companion (or, as Mal would say: whore) that helped Serenity (the spaceship) gain a landing on many planets that otherwise would have nothing to do with Mal. River Tam (played by Summer Glau) was the seemingly crazy younger sister of Dr. Simon Tam (played by Sean Maher), and due to her latent psionic powers and the damage from the experiments she had undergone, she was known for making odd, out-of-context statements. Randall is a fan of Firefly, and makes reference to it (and Summer Glau in particular) in various other comics - see under 'Categories' below.

When Cueball is introduced to the first two women, he learns that they behave in real life as on the Firefly show (Summer is strange and Jewel is a mechanical wizard) - this is why he begins to ask about Morena Baccarin, and also why the other two say "No." before he can finish the question "Is she really a prostitute?". In the last panel, Kaylee apparently wired-up Mal's controller to broadcast on the frequency of Cueball's skateboard, so it took control of his board, where Mal's stood still. (Buy a few RC models (Radio-controlled model) to play with

friends and inevitably this will happen. Where two controllers broadcast on the same frequency, so the two models are confused by the signals they receive.)

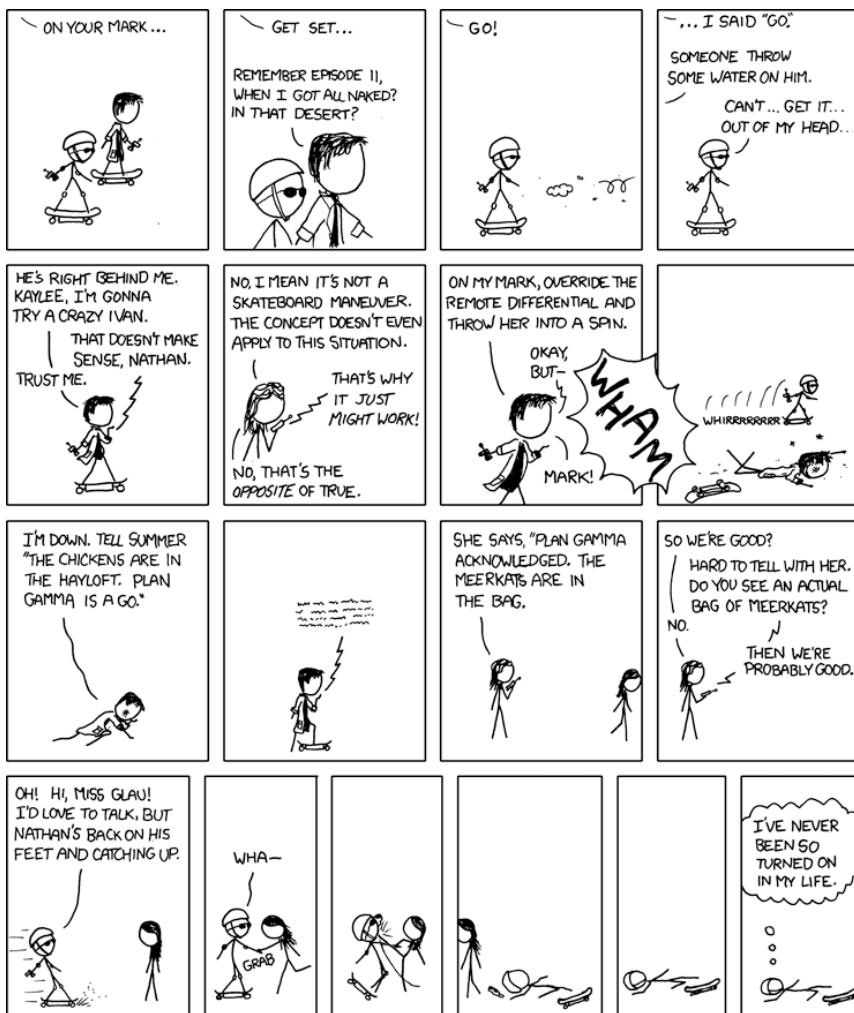
Terminator: The Sarah Connor Chronicles was a television series aired by Fox from 2008-09. Summer Glau played the role of Cameron, a Terminator; Cameron was played in a distinctly "strange" manner as a humanoid robot who finds much about humanity puzzling. Combined with her role as River Tam, the joke is that it wasn't Summer's characters who were eccentric, but that Summer Glau herself is actually just as strange and eccentric as she is shown to be on screen. Electric skateboards have been the subject of several other comics like 139: I Have Owned Two Electric Skateboards, 409: Electric Skateboard (Double Comic) and a panel in 442: xkcd Loves the Discovery Channel.

This series was released on five consecutive days (Monday to Friday) and not over the usual schedule of three comics a week. These are all the comics in The Race series:

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- 579: The Race: Part 3
- 580: The Race: Part 4
- 581: The Race: Part 5

#580: The Race: Part 4

May 07, 2009



Things are rarely just crazy enough to work, but they're frequently just crazy enough to fail hilariously.

Explanation

Firefly was a television series aired by Fox in 2002, but it was canceled after only fourteen episodes had been produced. Over ten years later, it still has a devoted fan base, apparently including Randall. The main characters were the crew of the spaceship "Serenity", including Captain Malcolm "Mal" Reynolds (Nathan Fillion), mechanical genius Kaywinnet Lee "Kaylee" Frye (Jewel Staite), the apparently insane psychic River Tam (Summer Glau), and six others not mentioned in this comic. Nathan Fillion appeared naked at the beginning and end of the show's eleventh episode, "Trash", after having been stripped of all his weapons, equipment, and clothes in a desert. Cueball is mentally overloaded by this image (either aroused or repulsed it is hard to say) to the extent that he misses the start signal.

Worried about his pursuer, Nathan wants to perform a Crazy Ivan, an emergency maneuver used by the crew of Serenity in the pilot episode of the series to escape the hot pursuit of a Reaver ship. It involves a 180° spin turn followed by rapid acceleration towards (and hopefully past) the pursuer, which does not have the ability to make such a rapid turn. In a Firefly-class vessel, it is performed by temporarily reversing the direction of thrust of one of the two atmospheric engines, achieved by physically rotating the engine nacelle. The name of the maneuver is taken from the antics of Soviet submarines in trying to detect (not to evade) enemy submarines hiding in the sonar blind-spot directly

behind their vessel. In reality, sharp turns suffice for this purpose; it is not necessary to completely reverse direction. The name entered popular culture after being used in the movie *The Hunt For Red October*.

Nathan appears to understand exactly what will happen. He asks Jewel to "override the remote differential", implying that the two driven wheels could then be powered in opposite directions, causing a spin-turn. As Jewel points out, this will be unlikely to have the intended effect. Nathan is much heavier than his vehicle, and he is not securely attached to it. Momentum is his enemy. Even if it were successful, it would be utterly pointless, because he would find himself heading away from the finish line. Cueball is only pursuing him with the intent to overtake him, and the Crazy Ivan guarantees that this will happen.

Summer Glau is often a target of sexual attraction for her appearance and her well-known, eccentric characters. River Tam, in the movie *Serenity*, had subconscious programming that caused her to be able to take on dozens of foes in hand-to-hand combat, and her Terminator character in *The Sarah Connor Chronicles* also regularly beat on men far larger than her, which, for many, just adds to the attraction. Thus, even as Summer fells him with a devastating kick to the face, Cueball is incredibly aroused. Electric skateboards have been the subject of several other comics like 139: *I Have Owned Two Electric Skateboards*, 409: *Electric Skateboard (Double Comic)* and a panel in 442: *xkcd Loves the Discovery Channel*.

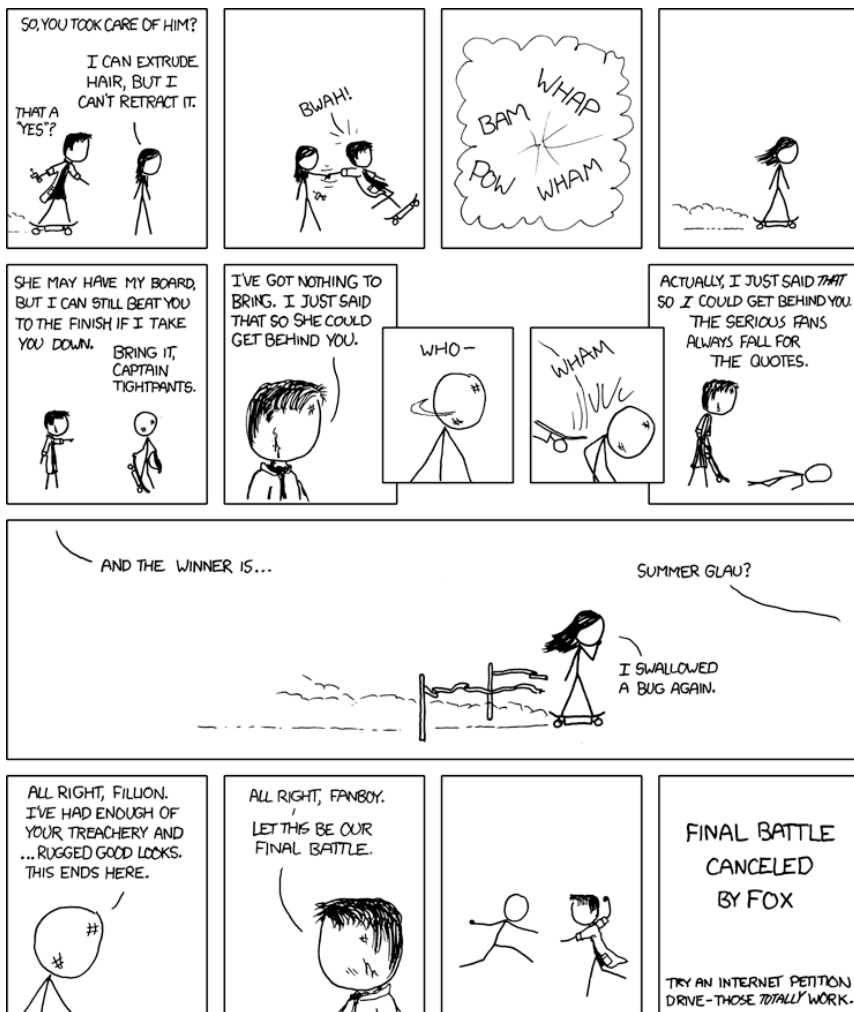
The title text refers to a common ability in fiction for characters to produce an idea that is 'just crazy enough to work'. In real-life situations (such as an electric skateboard race), people are rarely able to come up with an idea that is just out-of-the-ordinary enough to work perfectly, and in their attempts to do so, will come up with an idea that will instead absolutely fail to work (and make them look like fools to boot).

This series was released on five consecutive days (Monday to Friday) and not over the usual schedule of three comics a week. These are all the comics in The Race series:

- 577: The Race: Part 1
- 578: The Race: Part 2
- 579: The Race: Part 3
- 580: The Race: Part 4
- 581: The Race: Part 5

#581: The Race: Part 5

May 08, 2009



It was actually canceled because they just noticed he's been naked under that coat the whole time. There's a petition on Facebook to get Fox to un-cancel it, and one on Livejournal to get him to take off the coat.

Explanation

This is a continuation of the previous comic in "The Race" series, 580: The Race: Part 4. In panel 6 (2nd panel in the 2nd row), Nathan Fillion line is reminiscent of a similar quote from the 2nd episode of Firefly, The Train Job: "I just wanted you to face me so she could get behind ya." In the show, Malcolm Reynolds is aided by Zoë Washburne, his second in command, who gets behind the bar thug he is speaking to. In the comic, Nathan Fillion is using the line on a fan, but Gina Torres is not standing behind Cueball this time.

Summer Glau's line about growing but not retracting her hair appears to mean that because Nathan used her to stop Cueball, she has to stop him as well, which she neatly does. Alternatively, the line may be a random non-sequitur of the sort often uttered by her neurologically damaged character in the Firefly 'verse. "Bwah!" is a sound Malcolm makes during one episode in which one of his crewmembers inadvertently sneaks up on him while trying to ask him a question. When he is questioned about it, he says he has invented a new war cry, and promptly practices yelling 'Bwahhhh' in a confident manner while readying his pistol.

Summer's statement in the 10th panel about swallowing a bug is a reference to the movie Serenity, made in 2005 to conclude Firefly's storyline. After a harrowing high-speed chase in an open-topped hovercraft, the only comment from Summer's character is "I swallowed a

bug," showing that she was either unconcerned, or stunned, by the narrow escape. The final panel is a reference to Fox Television's treatment of Firefly. Firefly was cancelled after only 11 episodes of the 14 made were aired, leaving three episodes unaired. Internet petitions, contrary to the sarcastic suggestion in the final panel, pretty much never work.[actual citation needed]

Electric skateboards have been the subject of several other comics like 139: I Have Owned Two Electric Skateboards, 409: Electric Skateboard (Double Comic) and a panel in 442: xkcd Loves the Discovery Channel. Notably, Summer appears not to need the electronic controller to ride the board. Either she is being assisted remotely (as Nathan thought he would be, in the previous comic) or her character-linked strange nature is involved. This could possibly involve a purely psychic link, but with the evidence of being able pull Nathan from the board seemingly without effort (or accounting for his inertia) it may suggest she is something more akin to her biomechanical Terminator-series machine character.

In the title text, it is revealed that Fillion is 'actually naked' under his coat. This isn't very surprising in the xkcd universe, as stick figures are always 'naked' by normal definition. However, this is apparently the actual reason why Fox cancelled their final panel. Therefore, there have been two petitions - one to show the final battle, and another to get Fillion to remove the coat.

This series was released on five consecutive days

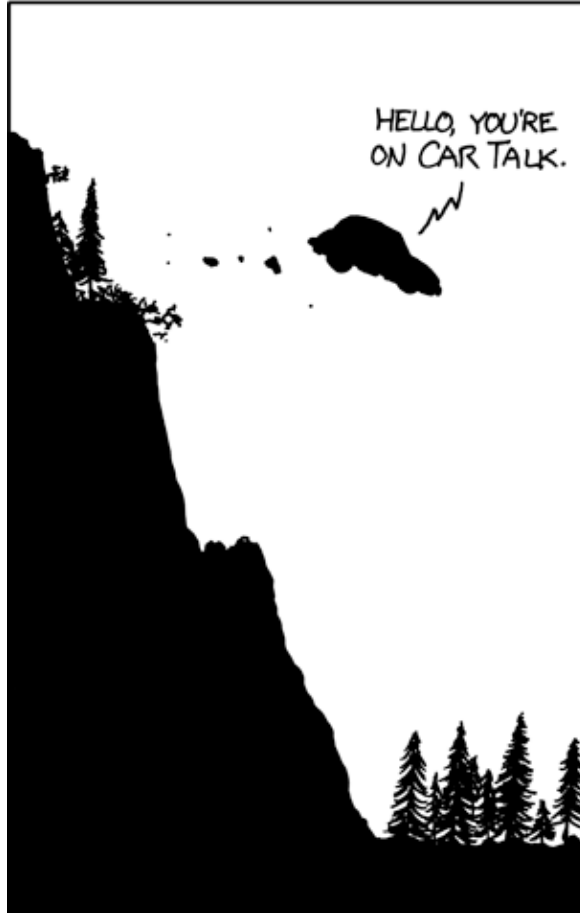
(Monday to Friday) and not over the usual schedule of three comics a week. These are all the comics in The Race series:

- 577: The Race: Part 1
- 578: The Race: Part 2
- 579: The Race: Part 3
- 580: The Race: Part 4
- 581: The Race: Part 5

#582: Brakes

May 11, 2009

OF THE POTENTIAL RESPONSES TO MY BRAKES'
FAILURE, I DID NOT CHOOSE THE BEST.



It was the funniest 6.5 seconds of my life, although as usual like 80% of it was just Tom and Ray's gasping, hacking laughter.

Explanation

A car's brakes fail on a winding mountain road. As a response, the driver calls a live radio phone-in show, overlooking the fact that he is in immediate danger and has no time to gather outside advice before improvising a solution. The driver fails to regain control of the car and plunges over a cliff.

If this ever happens to you,

- Try pumping the brakes, it may rebuild enough pressure to slow you down
- Downshift into second and then first gear, which should limit your vehicle's speed
- Use your "emergency brake", it's not just for parking (this can damage it, but it's better than dying)[citation needed]
- Otherwise, find a safe place to coast to a stop, if possible, or else
- Try to wreck your car in a way that won't kill you, your passengers or any other road-users/bystanders. Aim for something that will slow you down before stopping you, like a gravel turnout or a stand of bushes.

<http://www.wikihow.com/Stop-a-Car-with-No-Brakes>

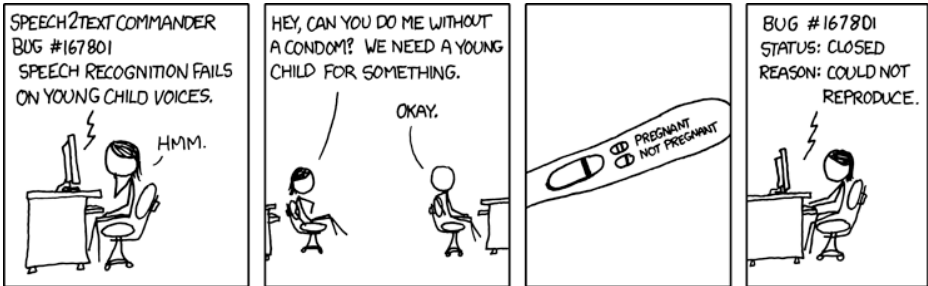
The title text refers to Tom and Ray Magliozzi who were the co-hosts of the weekly radio show Car Talk. It was a car advice/comedy radio show often aired on NPR

stations. While there is some actual advice given on the radio show, it's presented as a comedy/entertainment show. Much of the show did involve the hosts "gasping and hacking" as they ask non-relevant questions of the callers and add their own commentary or relate other personal asides and stories.

Since he claims that he has 6.5 funny seconds, he must have connected with them way before going over the cliff. Because in 6.5 seconds a car would fall approximately 200 m ($\frac{1}{2}gt^2$, with $g = 9.81 \text{ m/s}^2$, and t the time in seconds. This will give 207 m, but there will be a lot of air resistance). It is clear from the drawing that the car is still going almost straight out into the air, so it is still almost at the height where it left the road at quite a high speed (to get this far away without turning the engine down towards earth yet.) And the front of the car is just about 5 car lengths to the ground, which would make this a 10-15 m drop only (which would take less than 2 seconds to fall). But according to the comic it seems like he first connected with the show, just when the car has left the road...

#583: CNR

May 13, 2009



Can't and shouldn't.

Explanation

"Could not reproduce" (CNR as per the title) is used here as a double entendre. Because the reported bug is that speech recognition failed on a young child's voice, the programmers attempt to reproduce (themselves) in order to have a child to use as a test subject to understand and fix the bug, starting by reproducing it (the bug). However the attempt fails, as shown by the negative pregnancy test, and therefore the bug report is closed with the reason being "could not reproduce": they could not reproduce the bug because they could not reproduce themselves.

Nowadays, developers of software usually have a centralized repository of bugs which generally uses one of a handful of standard interfaces for tracking problems and desired features in software. There is usually a quick way of removing pending items from this system by changing the status to closed and selecting a reason from perhaps a dropdown list. "Could not reproduce" is a standard reason provided in almost all of these systems, so the novel pun provides extra humor to software developers. This reason also shows up in comic 937: TornadoGuard.

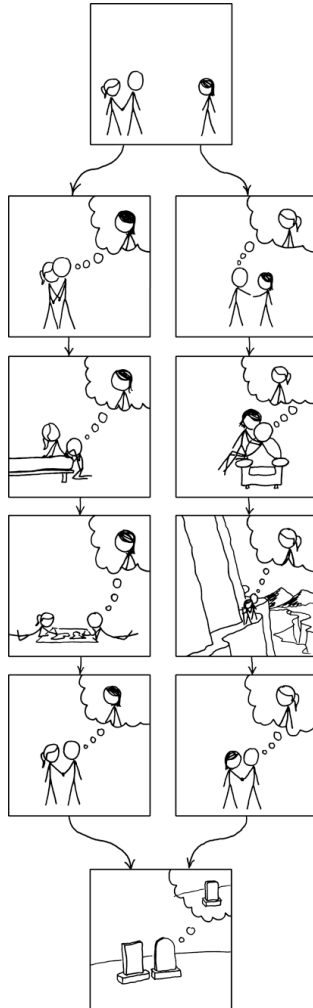
The secondary joke is that Megan has chosen a ridiculous method of obtaining a child for the relatively simple task of testing the software. The obvious solution is to find a pre-existing child to use; [citation needed] giving birth to (and, presumably, raising) a child would burden the

programmers with serious expenses, health concerns, and responsibilities; and it would take years before the child would be able to speak clearly enough to use the program.

The title-text "Can't and shouldn't" qualifies the bug report, meaning that the programmers not only could not reproduce, they also should not reproduce, as their reasons for doing so shows they have exceedingly bad judgment. (They also have poor child-rearing skills, as demonstrated in comic 674: Natural Parenting.)

#584: Unsatisfied

May 15, 2009



Forever comparing, never evaluating on any external scale. If you were a sort function, you'd never break the $n \log n$ barrier.

Explanation

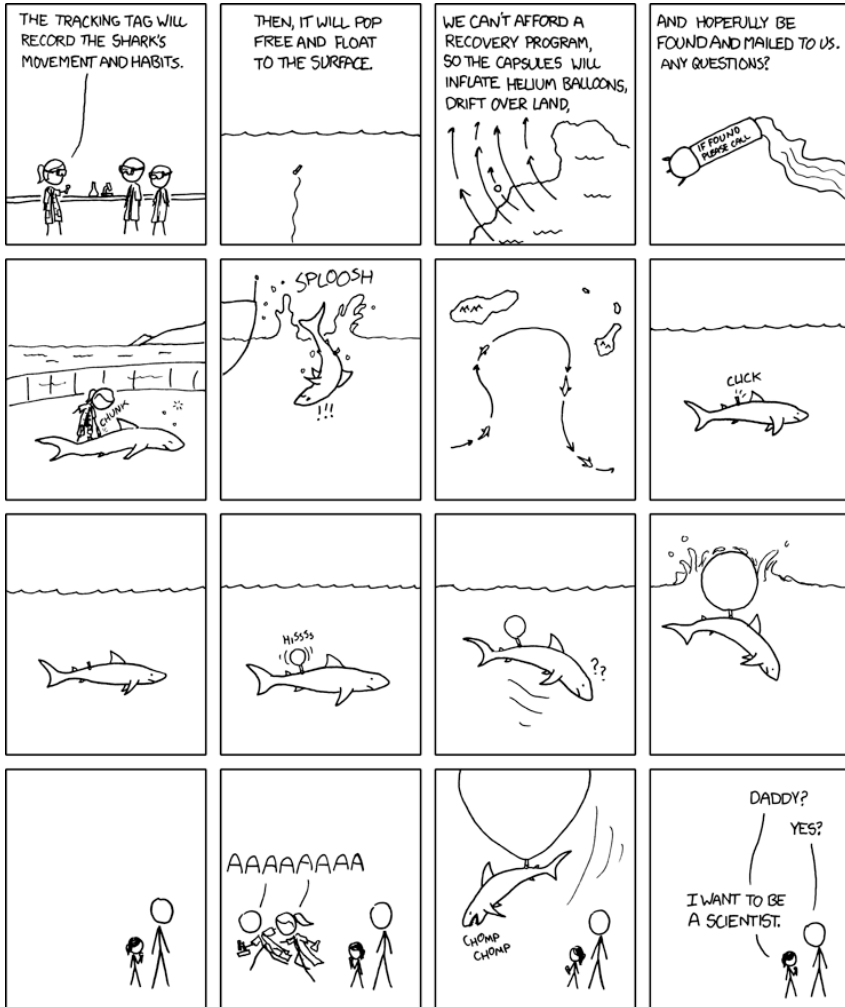
Cueball is trying to decide if he wants to stay with Ponytail who he is currently dating or leave her and have a relationship with Megan. The comic suggests that no matter which one he chooses he will never truly achieve happiness because of his longing for the option he chose not to take. In a sense this is a no-win situation. No matter what he does of interesting stuff (sex or otherwise) with Ponytail he will be thinking forever of Megan, and vice versa. This even goes on after he dies, where he lies next to one of them and thinks he would rather have been buried next to the other girl. This may have been averted, if Cueball had chosen polygamy and had relations with both girls, although then he might have cause to wonder what both the single-relationships could have been like.

The title text is referring to a concept in computer science. All comparison based sorting algorithms are incapable of sorting an arbitrary set of n values faster than an order of $n \cdot \log(n)$. On the other hand, non-comparison sorting algorithms (e.g. bucket sort) with external knowledge of the distribution of the values can sort them with order n . If Cueball was capable of establishing an external scale he could use a non-comparison sort, but as he does not know what the best thing for him is he is stuck with comparisons and thus he can't achieve better performance.

This comic is possibly a sequel to 310: Commitment.

#585: Outreach

May 18, 2009



Completely implausible? Yes. Nevertheless, worth keeping a can of shark repellent next to the bed.

Explanation

Scientific animal tracking is commonly used to learn more about other species, particularly endangered ones, as a way of better understanding their physiology, behavior, and what risks they face in the wild. It's used in a wide variety of sciences, including wildlife biology, conservation, wildlife management and zoology. The scientists in this comic are working on a rather limited budget as Ponytail explains, say that they can't afford the (relatively minuscule) cost of hiring someone to retrieve a tracking tag from the water. Hence, they devise a plan that would actually cost far more: create one that will pop free, float to the surface, and inflate a giant helium balloon, causing it to gradually drift over land. Eventually, the balloon will slowly deflate and soft-land, and with any luck someone will find it and mail it back to the scientists. The shark is depicted much larger than the humans, and the quantity of helium necessary to lift it (as the later panels show) would be extremely expensive.

The plan has an unintended consequence: the tag fails to pop free from the shark and proceeds to inflate the balloon while the shark is still attached. Although the balloon is shown too small to lift the shark (a helium balloon can only lift approximately one gram per liter in air), the shark miraculously rises right along with the tracker tag, drifts back over land, and goes right after the scientists that had been tracking it. When Jill (in her first appearance) sees the two scientists running frantically

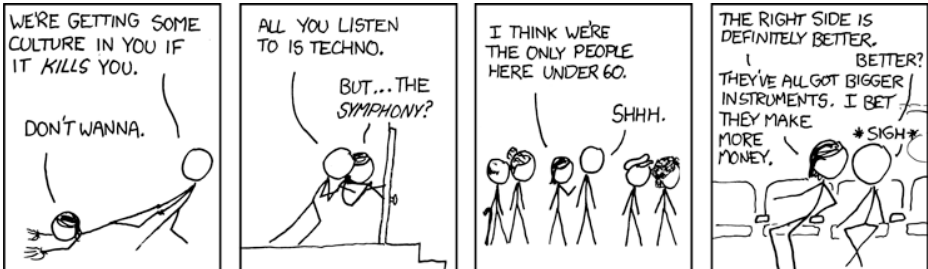
from a flying shark, she figures that if such excitement is a daily part of a scientist's job, that's a job for her, as she tells Cueball, her father. The title of the comic, Outreach, refers to the type of activities that scientists do in order to motivate kids to become scientists when they grow up, and it clearly worked for Jill who displays keen interest and great knowledge on many subjects in her next appearances.

The title text suggests keeping shark repellent by one's bed to account for the quite-unlikely event of something like this happening. Because you never know. It may be a reference to the Adam West Batman film where Batman just happens to have some in his helicopter. In reality, a balloon meant for lifting a tracker tag would be much too small to lift the shark, which is portrayed as being larger than person, so there is no danger. In addition, since sharks are fish, and fish cannot survive for an extended period of time above water, the shark would die even if this could happen in real life. This doesn't stop movies like Sharknado, which was filmed after this comic, to portray sharks floating in the air.

The title text of 1910: Sky Spotters seems to be a reference to this comic.

#586: Mission to Culture

May 20, 2009



It can't be very **MUCH** money ... they apparently can't even afford a sampler. I mean, with a little remixing, some of this could be kinda good!

Explanation

Cueball wants to take Megan out for his idea of a cultural experience; a symphony. The inference is that Megan's culturally impoverished because "all she ever listens to is techno". After much griping on various levels, for instance complaining that all the other attendees are above sixty years old, she starts to get into the experience — sort of. The big 'cultural lesson' she (mis)gleans from the experience is similar to what a sporting aficionado would gain from watching a sports event. So it could be said that Cueball's mission to culture was a mission impossible in Megan's case.

Her observation regards the seating configuration of a typical modern orchestra, in which the violinists all sit audience-left, while the violists, cellists and bassists, with clearly larger instruments, are on the right. But it is not the size of an instrument that determines the payroll of a musician.[citation needed]

The title text is just icing on the cake. A sampler is an instrument frequently used in techno music that samples other sounds and plays them back, usually electronically altered. Remixing is a process, also often used in techno, of editing recorded music to get a different sound. Many classical pieces have had success as techno remixes. One example is Pachelbel's Canon in D major, referred to in the title text of 339: Classic.

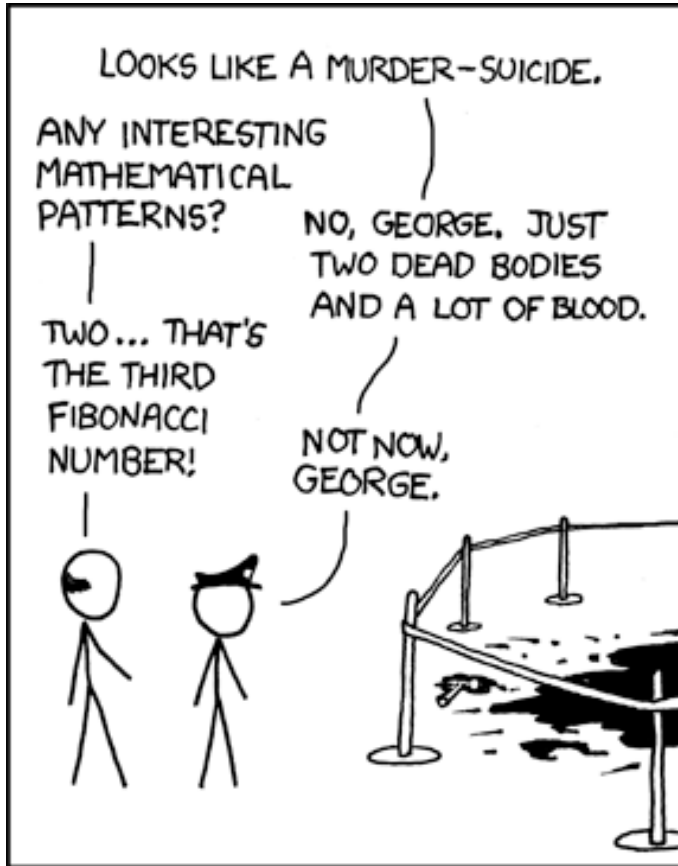
Techno music is the subject of 411: Techno and is also

referenced in 740: The Tell-Tale Beat.

Three of the old people in the line look very similar to the old people in 572: Together. In the very next comic 587: Crime Scene a man is again shown with hair only around the side of his head.

#587: Crime Scene

May 22, 2009



WHEN MATHNET SHUT DOWN, THE OFFICERS HAD TROUBLE REINTEGRATING INTO THE REGULAR L.A.P.D.

I think I see a Mandelbrot set! No, that's just blood splatters. Golly.

Explanation

Mathnet was a segment on the children's television show Square One Television, where police mathematicians solved crimes and other mysteries by math. It parodies the Dragnet TV show (and earlier radio drama) about the Los Angeles Police Department (LAPD). This comic plays on that by implying that Mathnet was a real department of the LAPD, and that when the show was cancelled and the department was shut down its mathematicians were forced to become regular detectives.

Here, George Frankly, one of the two lead detectives on the show (a parody of Dragnet character Frank Smith), observes a murder scene along with another officer. His fellow officer, knowing him, tries to tell him off by saying that it is just two dead bodies. As a mathematician, George is constantly looking for potential patterns in the data. However, in this instance there are no obvious mathematical patterns, yet George nonetheless tries to look for one and observes that "two" is the third Fibonacci number. Since several small numbers are in the Fibonacci sequence, the fact that the number of bodies is one of these numbers is not the least interesting. The other officer tries to shut him down, discouraging this unhelpful line of thought.

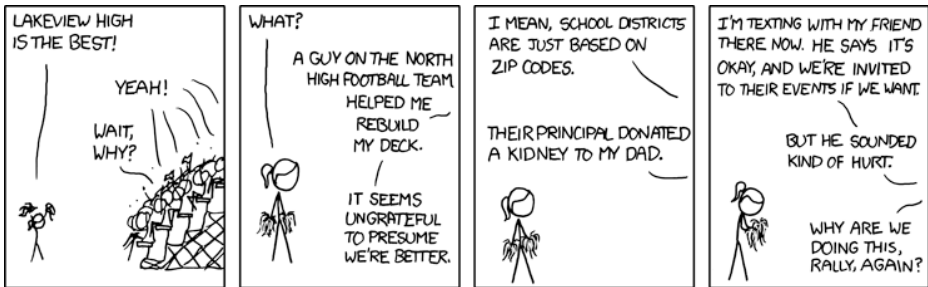
The title text shows that this may not have helped since George now thinks he can see a Mandelbrot set, but he does quickly realize that it was just blood splatters. The

Mandelbrot set is a formula used to create certain kinds of fractals that you might imagine seeing in the something like blood spatters. The last word Golly is in response to George realizing he is seeing blood spatters - something he probably never did before on the children show.

The second comic in a row (and third in 16 comics) where a man is drawn with hair only on the sides of his head.

#588: Pep Rally

May 25, 2009



You know, pep rallies weirded me out in high school, and they've only gotten creepier in retrospect.

Explanation

American high schools have a long and widespread tradition of pep rallies. These events typically take place during football or basketball season. The student body is crowded into the gymnasium, often the school fight song is played, cheerleaders and/or the school mascot might do a routine, and the team is introduced. The intent of such events is to inspire school spirit and encourage support for the sports team and attendance at games.

Randall apparently finds such events to be "creepy". The notion of "school spirit" tends to involve emotional involvement with a group identity which is almost entirely arbitrary. As Randall points out, American school districts are generally divided geographically (by ZIP code, in this case), and which school a person attends is both involuntary and more or less random. Moreover, the notion of such rallies is based around hyping up the school, with cheers calling themselves "the best" or something similar being quite common. Not infrequently, there's either an implicit or explicit denigration of whatever school is their primary rival in sports.

That notion clearly troubles Randall, because such divisions make no sense, and are potentially hurtful and even harmful.

In this strip, while some students appear to agree with the sentiment, others openly challenge it, pointing out

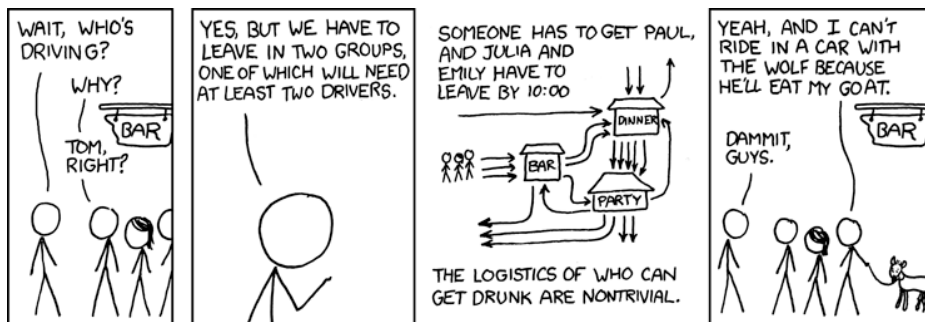
that students from the opposing school have done kind things for them. This sentiment appears to spread, as multiple people chime in, referring to good people who happen to go to, or work at, a different school. One student mentions that he's texting with a friend who goes to the other school, who "sounded kind of hurt" by their cheer.

In a superficial sense, this can be taken as a deconstruction of things like cheers and slogans (which were likely never meant to be taken literally). In a larger sense, though, defining oneself by an arbitrary group identity (be that national, ethnic, religious, political, etc) and treating that in-group as better than others, is common human tendency that can have very serious social consequences. The strip seems to encourage seeing others as human beings and being kind to everyone as more important than having strong group identities.

The title text says that Randall was weirded out by pep rallies growing up. Introverted people, particularly those with little love of sports, are often uncomfortable with such rallies. Now that he's older, he finds them even more creepy, possibly because he sees them as promoting a brand of tribalism and groupthink which he finds troubling.

#589: Designated Drivers

May 27, 2009



Calling a cab means cutting into beer money.

Explanation

When a group of people go together to any kind of event where they expect to drink alcohol, and would like to drive to and from the event, it is usual to select one who has to be the designated driver.[citation needed] This person will then stay sober during the event, and can thus safely drive the other people home afterwards disregarding how drunk the other people become.

However, as this comic points out, if it's not a simple task of going from A to B and back, all together at the same time, then it becomes a complex problem that requires an intricate kind of strategy and logical thinking to solve. And may need more than one driver.

In this comic Cueball addresses his friends, regarding this problem right before they enter a bar. It seems they have already decided that one of the friends will be the designated driver. But then Cueball mentions that they will have to leave in two groups. And for some reason one of these groups will need at least two drivers (this is hard to explain - see below under number of drivers.) So now they already need three designated drivers. Furthermore, someone has to go and pick up another friend. And also two of them have to leave earlier than the rest by 10:00.

In the third panel the situation seems to be illustrated. Three people are drawn outside the bar with three lines going to the bar, so the number of lines leaving and

entering each destination seems to represent a person each. Since the number of people leaving and entering each destination is the same, this makes it seem like the diagram is intended to be accurate. There are four people entering and exiting the bar and six people entering and exiting both the party and the dinner. The confusing part of the diagram is that there are only three people at the bar to begin with, not the four shown in the first panel. It also seems strange that someone will go back to the bar and especially that another goes back to the dinner from the party. It is thus not easy to make the diagram fit the description. See below for a possible take on the chart.

But the general concept would be that some people meet at a bar before joining the rest of a group at dinner, then later most of these move on to a party. After the party (or bar/dinner) people are going to head home in different groups.

The enormous complexities of planning who car pools with whom, from where to where, and when, make an excellent logic puzzle. And what is worse, anyone who has to drive needs to stay sober. So it is important to solve the puzzle before the drinking starts, or else there will be too few that can drive, or too many who never get to drink.

To make matters worse Tom complicates this already complicated logical puzzle, by involving the classic logic puzzle of the wolf, goat and cabbage (sometimes also known as Fox-chicken-grain puzzle). In the last panel, the

guy on the right is shown standing with a goat on a tether, saying he can't be in the car with the wolf. Cueball is then brought to swearing over this. (The goat puzzle was also the subject of 1134: Logic Boat and 2348: Boat Puzzle). And this may go some way of explaining why there needs to be a number of drivers.

The title text makes it clear why ordering a taxi is out of the question as it would take money out of the beer budget. Of course it also cost money to use your own car for gas etc. But when you already have a car, it is always cheaper to use that than pay for a taxi.

The chart[edit]

It's possible to match the chart up with the events in the comic if we assume two things: first, that everyone's initial position in the chart is at home, and second, that the party takes place at Cueball's house.

Whether or not Randall intended it this way isn't certain.

For clarity, I'll be referring to the first cueball as Cueball, the second as David, Megan as Emily, and the third cueball as Tom.

- Cueball leaves his house to meet Tom, David, and Emily at the bar.

When leaving the bar, Cueball returns home before dinner, possibly to set up for the party.

Emily leaves with either Tom or David to go to dinner while the other goes to pick up Paul.

- At dinner Julia arrives from her house, Cueball arrives from his house, Emily arrives with either Tom or David from the bar, and Paul arrives with the person that didn't drive for Emily.

When leaving dinner, David has to be the one going home by himself as Emily and Julia will leave together, Tom has agreed to be a designated driver, Paul does not have a car, and Cueball is the host of the party.

The remaining five take three cars to Cueball's for the party. (Julia's car, Cueball's car, and Tom's car)

- At 10:00 Julia will leave with Emily, and Tom will take Paul home once the party is over.

Number of drivers[edit]

Unless a more efficient solution exists, the minimum number of people that have to remain sober is three: Tom, David, and either Julia or Emily. Emily is able to begin drinking the earliest, starting at the bar and continuing the rest of the night. If the place everyone is having dinner at serves alcohol, Paul can begin drinking at dinner. If Emily elected to stay sober, Julia can start drinking when Paul does. Cueball is the last to be able to drink, only getting to start once everyone is at the party.

Interestingly enough, if the goat and wolf cannot drive, then they only make a difference if Paul has the wolf, in which case David would have to pick Paul up and take him home, and Tom and his goat would leave after dinner.

If either the wolf or the goat can drive, then a sober human driver is not needed for the vehicle in which that animal travels.

#590: Papyrus

May 29, 2009

MY HOBBY:

GETTING TYPOGRAPHY GEEKS
HEARTFELT CARDS PRINTED IN
"PAPYRUS" AND WATCHING THEM
STRUGGLE TO ACT GRATEFUL.



I secretly, deep in my guilty heart, like Papyrus and don't care if it's overused. [Cue hate mail in beautifully-kerned Helvetica.]

Explanation

One of the comics in the "My Hobby" series, this one touches on the fact that the font Papyrus is considered to be overused by many typography geeks, including the font's own creator. Pretending that he doesn't know that, Cueball gives Ponytail a heartfelt card written in that font just to see her twitch.

The title text says that Randall actually likes Papyrus, even if it is overused, and refers to the fact that he will soon be receiving hate-mail from people who dislike Papyrus. Those mails will be written in Helvetica, another commonly-used sans-serif font that is highly esteemed by typography geeks, designers, and often hipsters. It suggests that the designers would also take the time to check the "kerning", editing the spacing between individual letters to be visually pleasing - a time-consuming activity that, it can be suggested, would only be noticed by other designers. See also 1015: Kerning.

#591: Troll Slayer

June 01, 2009



We have met the enemy and he is us.

Explanation

Stephenie Meyer is the author of the *Twilight* novels, a series of young adult vampire novels. The series was highly successful with a large base of (largely teenaged and young adult) fans, but also has a huge number of detractors.

4chan, is an imageboard with the feature to post anonymously. Due to its anonymity and lack of content restrictions that most other sites have, the site became notorious as a gathering point for trolls (as well as a number of other unsavory groups).

This strip depicts a fictional conflict between Meyer and a group of 4chan users. 4chan is used to coordinate an attack on a *Twilight* board, likely blanketing the forum with verbal attacks, offensive language, and other posts designed to offend and upset fans of the series. Stephenie Meyer intervenes, asking them on 4chan to stop, but a representative 4chan user responds "Show us your tits", a command stereotypically directed by 4chan's denizens at users believed to be female. Accustomed to anonymous trolling having no consequences, the user mocks her request.

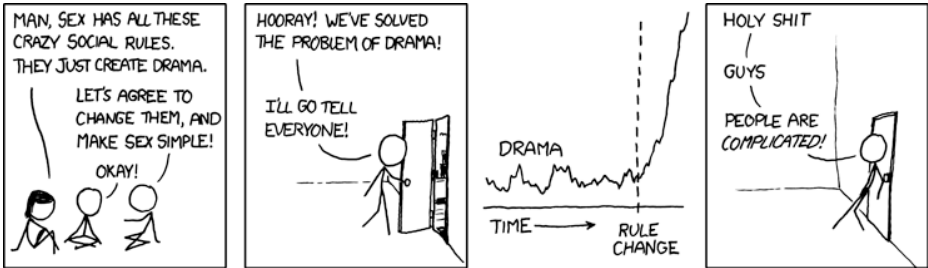
In response, Meyer writes 4chan into her next novel, presenting it as a haven for vampires. As she presumably intends, this draws huge numbers of *Twilight* fans into the forum, crowding out other users and likely rendering it unusable (or at least less usable) to its original user base.

The title text refers to Walt Kelly's famous saying. Kelly used it to refer to all of mankind, whereas here it refers to the users of 4chan, by bringing on the enemy of their forum themselves.

From xkcd: volume 0:

#592: Drama

June 03, 2009



This happens in geek circles every so often. The 'Hey, this is just a system I can figure out easily!' is also a problem among engineers first diving into the stock market.

Explanation

Megan and two Cueball-like guys discuss how irrational society's interactions about sex are. They decide to throw out all these silly societal rules to end drama forever and spread this philosophy to everyone they know, which immediately leads to a huge increase in drama as shown in the chart.

As one of the Cueballs in the comic states, people are indeed complicated and—crucially—what seems intuitive and rational to one person might seem completely irrational to someone else. This is especially true when it comes to something like sex, which involves a wide variety of implications, including emotional, physical, psychological, social, biological, personal, and even legal consequences. These impacts can be subtle or dramatic, and can interact in complex and unpredictable ways. This is presumably why every culture comes up with some set of rules and/or taboos around sex. While these rules can change over time and between cultures, the notion that they can be thrown out and replaced with something simple on a whim is extremely naive.

Furthermore, any one person's sense of what seems rational is based on incomplete information. The three people are trying to change all the sex rules—like the engineers referenced in the title text who think they can "solve" the stock market—can't even begin to conceive of all the chaotic factors affecting the system they're trying to fix. This is particularly true when dealing with people,

predicting human reactions and motivations notoriously difficult. As a result, it's nearly impossible to predict, just by their limited observation, which rules are truly rational and which aren't (and under what circumstances).

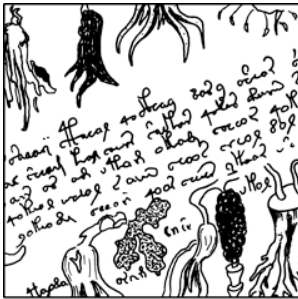
Geeks often fall prey to the fallacy that human interactions can be easily simplified if only a group of sufficiently qualified geeks put their minds to it as laid out in *The Geek Social Fallacies* and *The Geek Social Fallacies of Sex*.

Social rules that are adopted partly to avoid drama include laws surrounding marriage, childbirth, and alimony. These rules differ a large amount, but not incomparably, across different cultures. The study of them is a major concern in social science, and it is not unheard of to conjecture new ones, for example the work of the evolutionary psychologist Diana Fleischman.

The situation in the title text, with a bunch of engineers diving into the stock market, is also mentioned in 1570: *Engineer Syllogism*.

#593: Voynich Manuscript

June 05, 2009



THIS IS THE VOYNICH MANUSCRIPT—A BOOK, ALLEGEDLY 500 YEARS OLD, WRITTEN IN AN UNRECOGNIZED SCRIPT. IT'S SOME KIND OF VISUAL ENCYCLOPEDIA OF IMAGINARY PLANTS AND UNDECIPHERED "RECIPES".



IT COULD BE A HOAX, A LOST LANGUAGE, A CIPHER, AN ALIEN TEXT, GLOSSOLALIA—NO ONE KNOWS.

NO ONE? BUT IT'S OBVIOUS.



... OBVIOUS? LINGUISTS AND CRYPTOGRAPHERS HAVE BEEN STUMPED FOR DECADES.

THEY FORGET. HUMAN NATURE DOESN'T CHANGE.



JUST IMAGINE SOMEONE FOUND A BOOK FROM OUR TIME, FULL OF LISTS, ILLUSTRATIONS, TABLES, AND LONG DRY DESCRIPTIONS OF NONEXISTENT WORLDS WRITTEN IN AN INVENTED LANGUAGE. WHAT HAVE THEY FOUND?

...DEAR LORD. IT'S OBVIOUS.



500 YEARS EARLIER:

FORSOOTH! I CONCOCT AN ELIXIR OF COURAGE.

NAE! THE SOURCE BOOKE SAYETH THAT REQUIRES SOME WOLFSBANE!

YOUR DRUID DOTH LOSE TWO POINTS.



Wait, is that the **ORIGINAL** voynich manuscript? Where did you **GET** that? Wanna try playing a round of **Druids and Dicotyledons**?

Explanation

The Voynich manuscript is a very detailed book written in an unknown script, describing plants and recipes, most of which lack a real-world analogue. Over the past few decades, linguists and cryptographers have unsuccessfully attempted to decode the book. A cut out from the book is depicted in the first frame (real or similar).

Tabletop role-playing games (such as Dungeons and Dragons) are fantasy games with extremely detailed descriptions of fantastical worlds. The invented language is probably a reference to The Lord of the Rings in which author J. R. R. Tolkien invented several languages of which Sindarin (Grey elvish), and Quenya (High elvish), are the most famous.

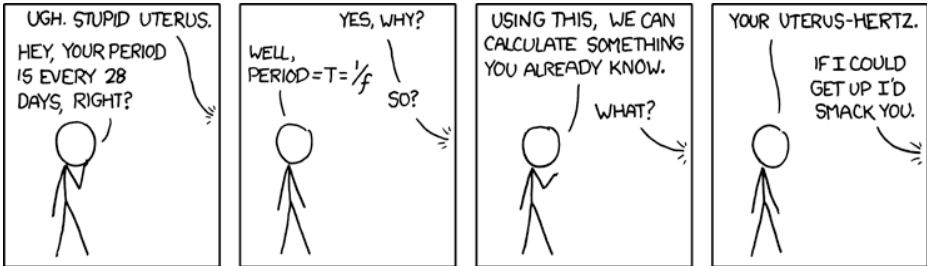
After being shown the manuscript for the first time by Megan, Cueball argues that it should be obvious that it's just an ancient role-playing-game rulebook, since the human tendency to invent fantastical worlds must have also existed in the past. That it is this obvious was again stated when the manuscript was referenced in 1501: Mysteries. In the last panel the book is used, 500 years ago, to play a game similar to Dungeons and Dragons. They speak in the garbled gobbledygook laypeople often produce when trying to imitate "Old English". Which attempts to sound something like early Modern English — which was indeed spoken around 500 years ago. The reference to the real plant Wolfsbane could also be a

reference to another invented world, as it is memorably mentioned in the first book of the Harry Potter series.

After concluding this, a shocked Cueball then asks in the title text how Megan got her hands on the original manuscript, which is in the Yale University's Beinecke Rare Book and Manuscript Library. Rigorous security rules now only allow carefully controlled access to materials under video surveillance, thus Cueball's reaction upon realizing Megan has somehow gotten her hands on the original manuscript. He then unexpectedly goes on to suggest the prosaic activity of playing Druids and Dicotyledons, a made-up name (a spoof of the name of Dungeons & Dragons) for the imaginary, hypothetical "game" that the Voynich manuscript could have been the (or one of several) gameplay manual for.

#594: Period

June 08, 2009



413 nanohertz, by the way.

Explanation

A period, also called a menstrual cycle, is a process marked by (among other things) a few days of abdominal cramps (this hertz a lot) occurring roughly once a month for women in the reproductive age.

"Period" (T) is also the term in mathematics for a measure of the rate at which something happens. It measures the length of time between occurrences. For example, a full moon happens about once every 29.5 days, so its period is 29.5 days. By taking the inverse of this, we can get a different measurement, its frequency (f) - the number of times an event happens within a given length of time. This is usually measured in hertz (pronounced the same as "hurts"), which is the number of times something happens in a second. Hertz is abbreviated as Hz, and since $f = 1/T$, with T measured in seconds (s), it follows that $1 \text{ Hz} = 1 \text{ s}^{-1}$.

The woman has her period every 28 days. Since we can calculate the frequency based on the period, we can, indeed, calculate her "uterus-hertz" but she already knew that her "uterus hurts". Yes, this has all been a setup to a terrible pun to make your head hertz. And if she had not been in such terrible pains that she cannot even get up, she would have smacked Cueball for it, which would really hertz. This makes it even more hertzful by Cueball, to make fun of his girlfriend in such a state.

The woman off screen is probably Megan given that she

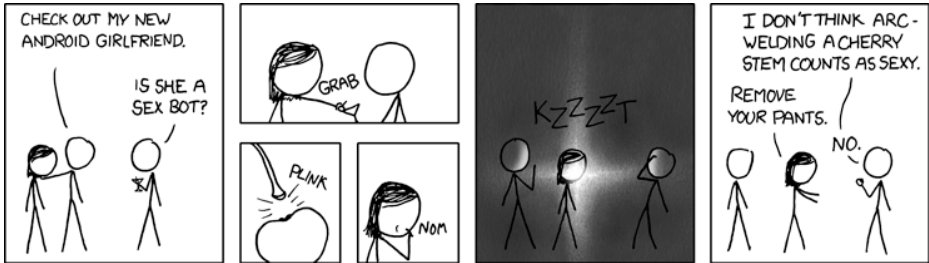
is most often depicted as Cueball's girlfriend, and the fact that he is in her home with her on the couch is a good indicator that they are intimate. (This is not enough to include this comic as one with Megan).

The title text gives the other answer that can be calculated from Cueball's musings, the actual frequency of the woman's period has a period $T = 28$ days. 413 nanohertz is the correct frequency as shown here by Google Calculator.

It can also easily be shown here:

#595: Android Girlfriend

June 10, 2009



Programming the sexbots to enjoy sex seemed a sensible move at the time, but we didn't realize the consequences of their developing fetishes.

Explanation

This is the first (of two) comics in the Android series, which continued directly less than two weeks later in 600: Android Boyfriend.

Cueball shows off his new "android girlfriend" (Megan) to his Cueball-like friend, who asks if the android is a sex bot. The android responds by pulling a cherry stem from the friend's drink and inserting it into her mouth. So far, the action appears to be an emulation of the party trick where someone puts a cherry stem into their mouth and ties it into a knot in order to suggest tongue dexterity that could be put to good use in kissing and oral sex.

However, instead of tying the cherry stem in a knot, the android activates an arc welder built into her mouth, which presumably reduces the stem to ashes. The friend proclaims that that trick is definitely not sexy. But then the android aggressively approaches him, reaching out and saying, "Remove your pants". The friend, not eager to experience close genital contact with the arc welder, sensibly, refuses. (Of course he may also not wish to take off his pants in front of his friend, at a party with drinks and presumably other people; or perhaps he does not wish to admit that he actually does find the arc welding act sexy...)

The title text bounces a few implications around. Developing robots with the capacity to either learn or feel emotions is an ethical factor and practical

consideration that is commonly explored in science fiction. Here, it's proposed that robots programmed for sex would have their emotions set to enjoy sex by default, but then use their capacity to learn to develop preferences on what kind of sex they want to have. This is potentially a psychological issue, mainly as to whether or not it would be considered "unhealthy", but more directly it's a customer satisfaction problem: what if a sexbot were to develop sexual fetishes that its owner finds unappealing?


It is also possible that the android shows a level of awareness superior to what is implied by the discussion in the strip. Then using an arc-wielder on that stem could be interpreted as a menace in response to a comment that would be insensitive if referred to a real person.

#596: Latitude

June 12, 2009

WE'RE IN A NARROW WINDOW IN WHICH PEOPLE ARE USING GOOGLE LATITUDE, BUT HAVEN'T LEARNED THE HABIT OF TURNING IT OFF WHEN THEY'RE DOING SOMETHING DISCREETLY.

I WROTE AN APP TO LOG FRIENDS' LOCATIONS AND WORK OUT ADDRESSES AND BUSINESS NAMES.



LOCATIONS		
TIME	MEGAN	ROBER
11:00 AM	HOME	
12:30 PM	EASTVIEW ADULT TOY STORE	HOME
1:30 PM	HOME	
2:00 PM	LAKETOWN SEX TOY SHOP	SCHOOL
2:30 PM	HOME	
3:00 PM	FRY'S ELECTRONICS	
3:30 PM	ED'S POWER TOOL EMPORIUM	SUBWAY
4:00 PM	HOME	
4:10 PM	HOSPITAL BURN WARD	

The **GI**, especially with the new **Android** upgrade, is way better than I originally thought.

Explanation

Black Hat shows Rob (from the chart) a mobile phone application he made to log and find addresses and business names for the locations of his "friends" using data from Google Latitude which was a location-aware feature of Google Maps that allowed a mobile phone user to allow certain people to view their current location. The reason it is worth doing so for him, is that most of those that use Google Latitude, haven't learned the habit to turn it off when engaging in "discreet" activities. And then Black Hat can access their whereabouts which he then uses in his app. The second panel shows the screen of Black Hat's smartphone with the logs for his two friends in table form showing activity for Megan and Rob, the latter log is partially cut off. (Regarding the use of these names see the trivia section).

Rob's log is fairly innocuous: home at 12:30 PM, school at 2:00 PM, and riding a subway (or possibly in a Subway restaurant) at 3:30 PM. This log shows that he did nothing interesting for Black Hat. There are also several holes in the table compared to the other column. This could either indicate that he stayed this long time those three places, but it could also indicate that Rob has already learned to switch off Latitude when he is not actively using it. This would fit with Black Hat's comment about a narrow window in which people haven't learned this. His friend Rob may already have thought of this himself, or maybe Black Hat has mentioned it to him before getting the idea for the app

thus warning him about the problem.

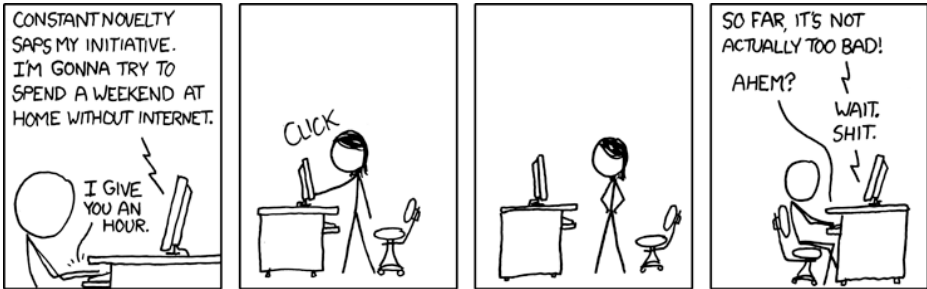
The reason Black Hat states that there only is a narrow window of time that people forget to turn Google Latitude off, is because people like him will make other people, who forget this, miserable. And then everyone will soon learn to turn the feature off making Black Hat's app useless. Megan's log appears to prove Black Hat's point: She was home at 11:00 AM, at a sex toy store at 12:30 PM, home again at 1:30 PM, at another sex toy store at 2:00 PM, home again at 2:30 PM, then at Fry's Electronics at 3:00 PM, and at a power tool store at 3:30 PM, finally home again at 4:00 PM only to be at the hospital burn ward at 4:10 PM. The last entry is the only one where the interval is not half an hour indicating how fast Megan had to get to the hospital after getting home with her new power tools and electronics.

This suggests that Megan first tried the sex toy(s) from the first store, found them insufficiently satisfying, purchased additional sex toys from another store, was still unsatisfied, and then purchased some electronic devices and power tools (either to improve the performance of her sex toys or to apply directly for additional stimulation). The results were apparently more painful than pleasurable, necessitating a quick visit to the hospital burn ward. Overall, Megan has had an at first unsatisfying day and then finally a rather bad day, considering where the burn is most likely to be... She would almost certainly not be pleased to learn that Black Hat has been tracking her whereabouts and sharing this with their mutual friend Rob.

The title text shows that Randall liked the T-Mobile G1, also known as the HTC Dream, especially with the upgrade to Android Cupcake, more than he previously thought because it allows for more capabilities and the interface is clean and easy-to-use when compared to other "smartphones" of that time period (because the G1 was the first phone to introduce the Android operating system) and it allows for special Google networking, allowing for apps like Maps to run better (making it easier to run apps like Latitude). From what able to be gathered in the comic, it is Black Hat who says this, because he is the one who uses the app and shows it off. He would be the most likely one to benefit from this kind of phone running this kind of OS/app.

#597: Addiction

June 15, 2009



But if you unplug everything, it gets so quiet you hear that high-pitched empty-room hum. And then the whispers begin.

Explanation

Megan is attempting to stay a weekend at home without the Internet as she feels the constant exposure to novelty (from her internet surfing) saps her own initiative. She writes a "last" on-line message about her resolution to Cueball, but he writes back that he doubts she can do it for even one hour.

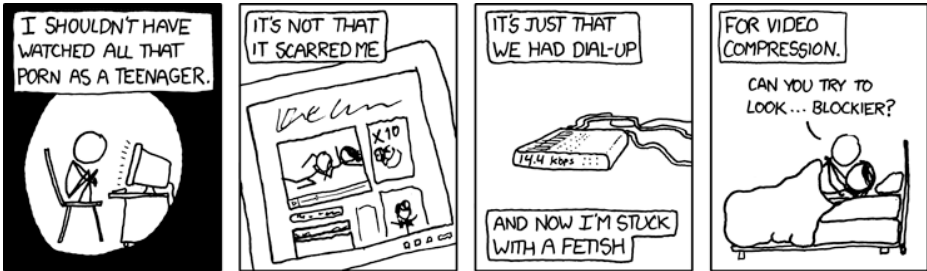
She turns off her computer (or at least the screen) and stands up triumphantly next to it, however then she logs right back on to write to Cueball that it's not half bad being off-line, thus violating her original attempt as she clearly used the internet to send the message to Cueball. She doesn't even realize she did this until Cueball replies with the written sound Ahem? proving he was right about less than one hour.

Very typical of people having some kind of addiction, in this case for being on-line, they may not even realize when they indulge into it, which is the case with Megan here.

The title text elaborates on Megan's addiction, saying that when she turns off all of the machines in the room, it results in an "empty-room hum". This is a high pitched buzzing noise, which it is suggested results from the brain increasing its sensitivity to noises. This is a fairly normal experience, but the "whispers" mentioned may be slightly more sinister, as this is frequently associated as a sign of schizophrenia. See also 1590: The Source.

#598: Porn

June 17, 2009



I have a thing for corrupt women.

Explanation

Cueball's mention of how porn did not scar him is a reference to negative effects of pornography. One commonly cited effect is a tendency to develop unrealistic ideas about sex and unrealistic expectations that potential sex partners will look like the ones seen in porn.

In fact, the porn really did affect the way he looked at women. Due to dial-up being of such a slow speed, videos that needed to be transmitted via dial-up had to be compressed using a lossy format, which reduces file sizes substantially but also causes heavy data losses. The result was that the decompressed file would be of visibly degraded quality compared to the original uncompressed file. In this case, the lossy format eats away at the detail of the picture, which, during decompression, results in blocky artifacts in an attempt to "reconstruct" the lost data.

Thus, Cueball's image of women was in fact affected by his porn viewing habits. However, instead of the issue usually raised (expecting sex partners to have the physiques of porn performers), he has learned to associate sexual arousal with lo-fidelity blocky images of women. Since he associates blocky pictures with arousal, he seems to have trouble enjoying sex with his comparatively hi-fi girlfriend. In other words, the porn really did scar him after all.

The title text expands on this, referencing file corruption. It is also a pun on female "corruption," or a woman's awareness of her sexuality.

#599: Apocalypse

June 19, 2009



I wonder if I still have time to go shoot a short film with Kevin Bacon.

Explanation

This comic begins with the beginning of the Apocalypse, hence the title. It is depicted, properly, with a very dystopian color picture with several yellow burning meteors striking down from the blood red sky, towards a black, red, orange and yellow ground. The way the panels are drawn below makes a transition from this dark image to a normal comic, with the first normal panel being superimposed on the dark image.

In this image Beret Guy shouts out The apocalypse! And then he continues to explain what this will mean: The skies burn, the seas turn to blood, and the dead walk the earth!

All three sentences are attributed to the apocalypse, but it seems that the first one about the sky burning, actually comes from a translation of one of the Nostradamus predictions which has, amongst others, been used to "predict 9/11". In Revelation 16 from the Bible about the Seven bowls, which are a set of seven plagues of God's wrath poured over the wicked towards the Apocalypse, the second bowl describes that The Sea Turns to Blood. The resurrection of the dead is from the biblical version of the Apocalypse, the Last Judgment.

After Beret Guy has announced this, he runs into Cueball who has heard part of this, but he is only interested in the last part and asks to check if he understood correctly that the dead will walk the earth.

When this is confirmed Cueball becomes very busy.

He runs to his office and quickly writes a scientific math paper, then runs as fast as he can to the math department and get his colleagues to sign it. Then he runs to a cemetery where the dead are rising, finds the one he searched for, and asks the resurrected zombie if he is Erdős. When confirmed that he is indeed Erdős, Cueball asks him to sign the math paper.

Paul Erdős (26 March 1913 – 20 September 1996) was a Hungarian mathematician who (according to Wikipedia) published more papers than any other mathematician in history, working with hundreds of collaborators. His grave is in the Kozma Street Cemetery in Budapest.

There is an in-joke developed among mathematicians called the Erdős number (similar to a Bacon number for film actors, referenced in the title text, see below). By definition, Erdős has an Erdős number of 0. Everyone who has co-written a mathematical paper with Erdős has an Erdős number of 1. Everyone who collaborated with them (but not Erdős himself) is assigned an Erdős number of 2. In general, if k is the minimal Erdős number of all the people you've written papers with, your Erdős number is $k + 1$. The Erdős number is the length of the shortest "chain" from you to Erdős.

Thanks to collaboration between mathematicians and other researchers, many people in science and medical research now have Erdős numbers. Not everyone has an Erdős number, though; people without any chain linking

them to Erdős have an undefined Erdős number. For example, most people who are not mathematicians or scientists do not have Erdős numbers. Nor do mathematicians and scientists whose publications were written by themselves only with no collaborators.

By this trick Cueball thinks that he and his colleagues will now all have an Erdős number of 1. The joke is that he would be using his last few hours in this life to write a math paper just to improve his and his friends' Erdős numbers.

There are, however, many problems with his idea, even assuming the dead will walk the earth on that day. First of all, just having your name on a piece of paper with Erdős's signature does nothing for your Erdős number. It needs to be a scientifically valid paper, published in a peer reviewed scientific journal. And given that the apocalypse is happening, there seems no time, chance or reason to publish any more math papers.[citation needed]

Even if there were time, it would not count for much to have someone sign a math paper they haven't even read, let alone had anything to do with the actual writing and research. The same would be true for the other five mathematicians who signed it. But of course many papers have coauthors who did not do much more than work in the same department as the person who actually wrote the paper (a sad but true fact). Presumably Cueball's friends assume that nobody will investigate whether they, or Erdős, truly participated in the writing

and research of Cueball's paper.

Furthermore, even if it did count, they will not be able to take the paper with them into the afterlife (although people can come back to life after being clinically dead they don't experience the afterlife), and thus since no one would have had time to read the paper, no one would know they had an Erdős number of 1. In the afterlife they could all say that they had such a number, but then again everyone else with such an interest could do the same, since no one could prove otherwise. Of course if you end up in the same part (Heaven or Hell) of the afterlife as Erdős he could confirm or deny the claim, but that would probably not help Cueball and his friends, since he could tell the truth about their paper. (Erdős was known for using an idiosyncratic set of slang terms, in which he described people who had stopped doing mathematics as having "died", whereas people who had died had "left".)

That the whole comic is about the Erdős number, and not just Erdős signature, is made clear in the title text which refers to a similar (and less esoteric) meme called "Six Degrees of Kevin Bacon", or simply Bacon numbers. This time, the chain's center is actor Kevin Bacon, and the links are formed by two people appearing in the same movie. Unlike Erdős, Kevin Bacon is not dead yet, so those of you wishing to get a Bacon number of 1 still have a chance.

In the title text Cueball thus wonders if there is still time for him to make a short film with Kevin Bacon, now he

has used so much time on improving his Erdős number. Again, if the film hasn't been shown to the public it would not count for anything...

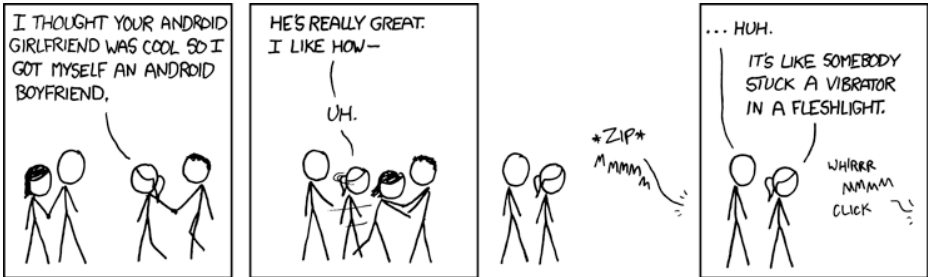
One of the mathematical scribbles appearing in panel 5 shows the square root of 163, which may be a reference to Ramanujan's constant.

403: Convincing Pickup Line has a parody of the Erdős collaboration graph.

Zombies are a recurring theme in xkcd, particularly zombie scientists, which has also occurred both before with Richard Feynman in 397: Unscientific and after with Marie Curie in 896: Marie Curie.

#600: Android Boyfriend

June 22, 2009



Which is, coincidentally, the most unsettling mantelpiece decoration in my house.

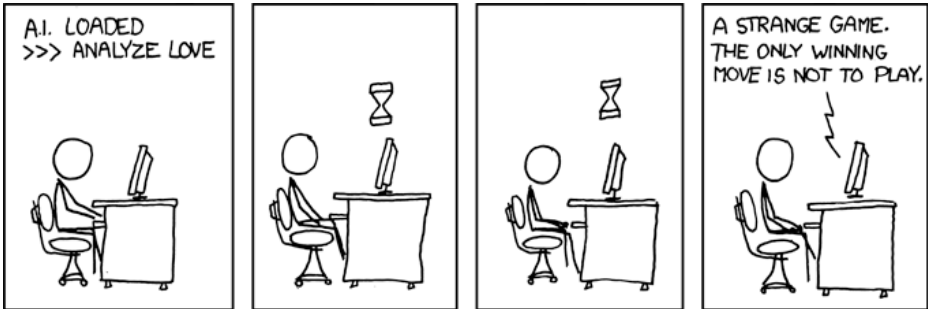
Explanation

This is the second (and last) comic in the Android series, referring directly back to 595: Android Girlfriend, where Cueball showed that he had an android girlfriend Megan. So now Ponytail has decided she would also like to have an android boyfriend (Hairy). But upon bringing these two androids together, they fall for each other and decide to have "sex" on the spot, resulting in several mechanical sounds off-panel while their "owners" watch on with disgusted interest.

Vibrators and Fleshlights are sex toys that represent male and female genitalia, respectively. Ponytail's flat description indicates that she is not particularly aroused by what amounts to a pair of animatronic sex toys rubbing against each other. Randall's title text claims that he has actually done such a thing, and stuck it on his fireplace mantle for all his house-guests to see. He admits though that it is the most unsettling mantelpiece decoration in my house. References to fleshlights is a recurring theme in xkcd.

#601: Game Theory

June 24, 2009



Wait, no, that one also loses. How about a nice game of chess?

Explanation

The comic and title text is a direct reference to the movie WarGames.

In the movie, the artificial intelligence (AI) that controls the U.S. nuclear weapons is asked to play Global Thermonuclear War, a real time game simulating a nuclear attack scenario.

Spoilers: In the movie it then takes the simulation to the real world, planning to launch a real attack on the USSR. In the end the AI is tricked into quickly running through several scenarios of the game, and then shuts down its planned attack as a result of what it finds out.

After analyzing all possible strategies, the AI reports: "A strange game. The only winning move is not to play. How about a nice game of chess?" Interpreted literally, this means that the computer has figured out that it will lose the game no matter how it plays, so it chooses to play chess instead (at the time of the movie, computers could not yet beat the best human chess players, so it would be more interesting). A more profound interpretation is that wars always end badly for all parties involved so it's better to play nicer games like chess.

In this comic Cueball loads an AI and then ask it to "analyze love" (equivalent to playing the "love game"), which initially could be expected to end happily for everyone involved, as love is the opposite of war and war

ends always so badly. Surprisingly, the result from the AI is similar to the war games. Thus if you "play the love game", you'll end up badly, regardless which moves you play.

The title text leaves love as looking actually worse than war, since in war there's at least the "winning move" of not playing, however in love even refusing to play means that the player loses the game anyway. Randall is thus stating that you have to go after love, even though you know you will lose/get hurt sometimes, because you will for sure also lose the game, even if you pretend not to play. Then Cueball or the AI again suggests a game of chess, as in the movie.

#602: Overstimulated

June 26, 2009



My favorite thing to do at parties is to talk judgmentally about people who aren't there.

Explanation

After being cooped up working on papers, Cueball goes to a party, only to find himself tuning out the gossip of his friends in order to work on math problems in his head. He writes down the prime numbers on cards, and then stretches them out such that the area of the card is the same (say, 1), but one of the sides has been elongated to a length equal to the number on the card. This reduces the length on the other dimension to the reciprocal of the number on the card (i.e. $1/n$, with n being the number on the card), according to the area formula for rectangles.

Stacking these reciprocals all up will eventually diverge, meaning the sum will be infinite without ever leveling off. This is referred to as the divergence of the sum of the reciprocals of the primes, and was proven by Euler in 1737.

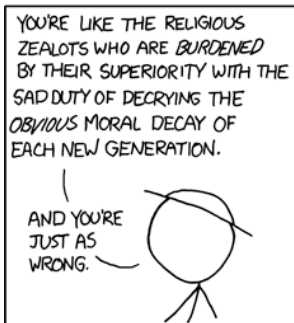
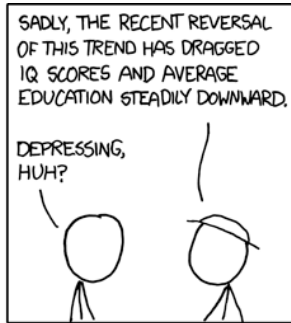
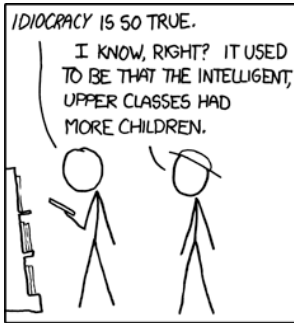
The Cambridge Aspergers Test includes questions on preferences for, and ability to cope with, social situations. It also asks the person taking the test if they have an affinity for numbers and see patterns in every day objects. Cueball could possibly score high on the Asperger's scale — or he could just be introverted, or find math more interesting than criticizing others which is generally considered in science circles a dull thing to do considering the vast variety of other topics and activities available. Introversion is an idea from psychology. Thinking about things on one's own is often relaxing for an introvert, while hanging out with other people is not.

Hence the irony of the comment in the last panel. Cueball's friends fail to realize that hanging out with them is actually more stressful for him than doing math - especially when people are doing nothing but talking negatively about those not present.

The title text mentions people that talk negatively about people that aren't there. A much later comic; 1176: Those Not Present, is about just that.

#603: Idiocracy

June 29, 2009



People aren't going to change, for better or for worse. Technology's going to be so cool. All in all, the future will be okay! Except climate; we fucked that one up.

Explanation

The title of this comic is a reference to the dystopian comedy *Idiocracy*. The film postulates that over about 500 years, society will suffer from a massive decrease in intellectual potential. This development is implied to be due to the fact that people are more likely to reproduce due to lack of education, absence of planning, and general negligence with regards to the consequences of their actions.

Cueball professes his approval for the theories represented in the film, and the guy with the white safari hat agrees with him, arguing that "the intelligent, upper classes" had previously had more children, but that this trend has reversed, dragging down intelligence and education levels. (Note that Safari Hat is not the same guy as White Hat! See below.)

But in panel 3, Safari Hat suddenly reveals that all the "facts" he cited were wrong, and we learn that he doesn't support the dysgenic thesis at all. He turns to accuse Cueball of conceited self-righteousness (using religious zealots as an analogy), harshly condemning intelligence dysgenics as an excuse for feeling superior to the rest of society. Cueball tries to rebut Safari Hat's arguments, but is cut off both times. From what we see of his words, he may be trying to use his dislike for modern popular entertainment as support for his thesis, and appears to suggest a compulsory eugenic breeding program. The latter appears to particularly upset Safari Hat, as he

responds with his most direct insult: it would be better to reproduce with a stupid person than an elitist like Cueball.

It's pretty clear here that Randall is voicing his opinion through Safari Hat, and using Cueball as a straw man.

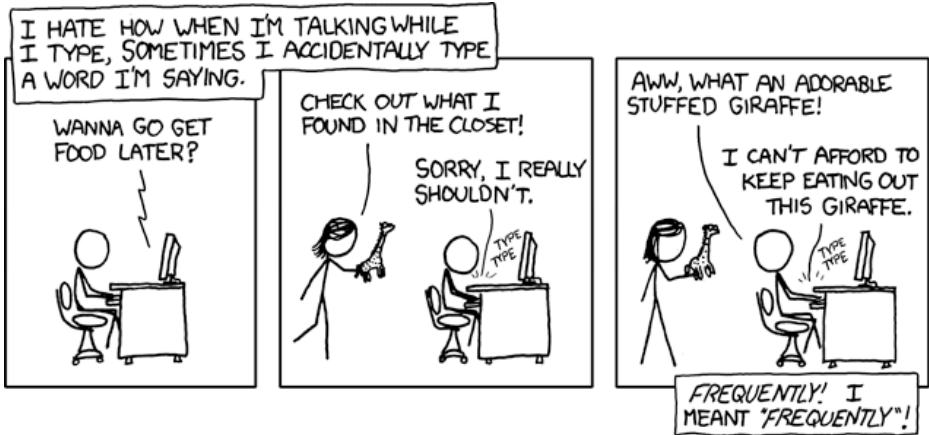
The title text reflects the opinion. It makes a few generally optimistic comments on the future, but then finishes on a rather sour note about climate change. Climate change is a recurring theme in xkcd.

Safari Hat's initial claim was clearly designed to include only false statements that might sound true to someone who wanted to believe them: there's always been a trend for poorer and less educated to have more children, it wasn't different in the past (and there's some evidence that this correlation is becoming less reliable with changes in culture, opportunities for women, and the availability of birth control). The claim that IQs and education are decreasing is also false: educational attainment has been rising for decades in all developed countries. Measured IQs have also risen, but this is a more complex picture. Whether this is a shift in actual intelligence or just an artifact of how it's measured remains a topic of debate, and the rise in IQ scores appears to have stopped and even reversed across multiple countries. Still, studies have refuted the notion that a decline in IQ is being caused by a dysgenic effect, meaning that the central thesis of Idiocracy remains entirely fictional.

The irony, of course, is that Cueball is implicitly holds himself up as an example of intelligence (standing in contrast to the social decline in intelligence) and yet shows himself to be badly misinformed about the top he's discussing.

#604: Qwertial Aphasia

July 01, 2009



If this were SMBC, the alt-text drawing thingy would be a giraffe hooker fluttering her eyelashes.

Explanation

Randall has invented the term Qwertial Aphasia to describe the common experience of having a word, from a spoken conversation, accidentally spill over into something one is typing, often with humorous results.

The description "Qwertial" refers to the position of the top row of letters in the most common keyboard arrangement, the QWERTY keyboard layout, as this is only something that afflicts you while typing. Aphasia is a class of medical conditions which affect the production and understanding of language.

In this case Cueball is in the process of replying on the computer to his friend who just asked if they should go out to eat some food later. Cueball is about to explain why he should not, when Megan walks in and disturbs him with her stuffed toy giraffe which makes him say the word giraffe.

The joke set up in the comic comes from the substitution of the word 'giraffe' for the word 'frequently', which changes the whole meaning of Cueball's last sentence. The original sentence would have been I can't afford to keep eating out this frequently. The unintentional replacement makes 'giraffe' the object of the sentence, and implies that Cueball is eating out (slang for cunnilingus) a giraffe. He tries to correct himself by writing that he meant frequently but the damage is done and he will be the laughing stock with his friends for a

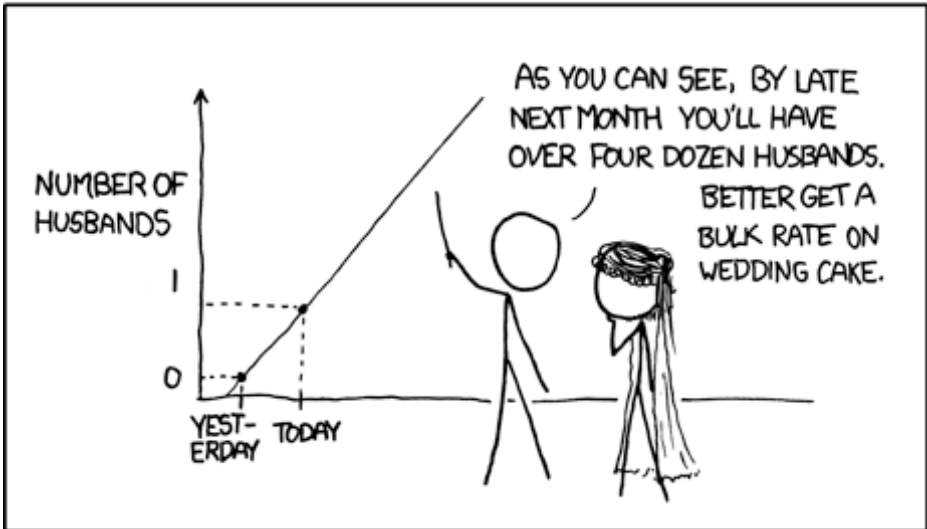
while.

The title text expands on the framing of a giraffe as sexual by also making the giraffe a prostitute. SMBC refers to the comic Saturday Morning Breakfast Cereal, a whimsical joke-a-day comic which comes with a second illustration, which can be seen by clicking on a button known as the "votey". This additional panel often serves as a second punchline in the same way as the title text does in xkcd. Zach Weiner of SMBC responded to this title text in the votey on July 2, 2009, the day after this comic was released.

#605: Extrapolating

July 03, 2009

MY HOBBY: EXTRAPOLATING



By the third trimester, there will be hundreds of babies inside you.

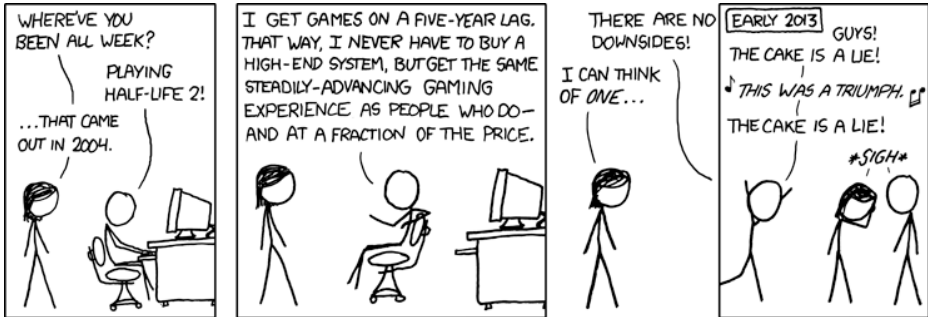
Explanation

This comic is a joke about the incorrect application of linear extrapolation. By connecting two points without any context, we can come up with incredibly funny and absurd results. Here, connecting a bride's number of spouses yesterday (zero) and today—her wedding day—(one) can result in a linear extrapolation to hundreds of spouses a year. Cueball presents the accumulation of husbands as though it were a phenomenon beyond the bride's ability to control. Using similar points for pregnancy (yesterday: no babies, today: one), we can get 200+ children inside a single person by the seventh month of pregnancy.

This is another comic in the infrequent My Hobby series. Extrapolation and interpolation, often absurd, are also recurrent topics on xkcd.

#606: Cutting Edge

July 06, 2009



I remember trying to log in to the original Command and Conquer servers a year or two back and feeling like I was knocking on the boarded-up gates of a ghost town.

Explanation

Half-Life 2 is a computer game, specifically a first-person shooter, released in 2004. In the above comic, Cueball plays the game in 2009. Newer games usually require more powerful computer parts, such as GPUs and RAM. The prices of these computer parts usually start expensive but drop quickly, so even a very cheap computer developed in 2009 will comfortably run a 2004 game.

Additionally, the price for an older game is considerably less than those of the more recent variety. Even the price of a once-new, highly anticipated AAA game is almost definitely guaranteed to have fallen due to the presence of newer games and the relative maturity of the present game. Most of the expected sales of a game happen near the release. A game would not be deemed that lucrative after 5 years, prompting a price drop to justify its sales or even printing. Sometimes, a game will be released with several, if not all, expansion packs at a fraction of the price of purchasing them all separately during the initial release.

However, the downside to Cueball's strategy is that his gaming knowledge will be five years out of date. In a subculture that moves as fast as video games, it's almost impossible for Cueball to embarrass himself harder.

On the last panel, "The cake is a lie" and "This was a triumph" are references to Portal, a video game released

in late 2007. The cake references originate from the promises of cake that GLaDOS, a character in the game, makes to the player. Exploring the levels reveals several hiding places that seem to have been used, in one of which the player can find the words "The cake is a lie" repeatedly scrawled on the wall. As predicted, Portal was indeed considered old-fashioned by early 2013, with the developers themselves stating they were sick and tired of the endlessly parroted jokes. Both Portal and Half-Life 2 were released by the same company, Valve, and they released Portal 2 in 2011.

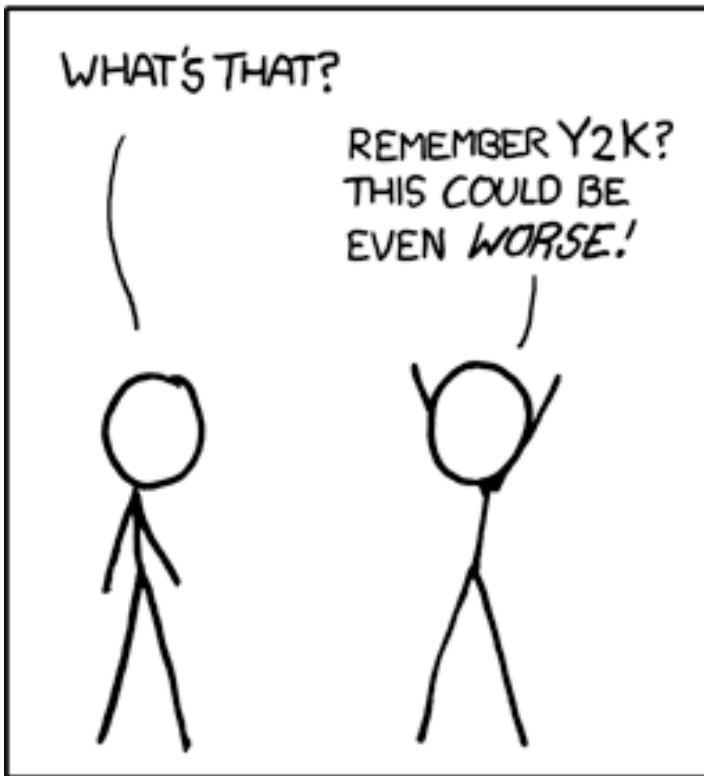
The song "Still Alive", which the lyric "This was a triumph" comes from, was previously referenced in 375: Pod Bay Doors, and later referenced in 1141: Two Years.

The title text also points to another flaw in this strategy: multi-player gaming requires other players, so if you play a game five years after its release, there's often nobody else to play with. It's even worse with online gaming, as the company hosting the online server may have shut it down a long time ago. The idea that some games change over time was revisited in 2189: Old Game Worlds. However, some game communities do last longer than others.

#607: 2038

July 08, 2009

I'M GLAD WE'RE SWITCHING TO 64-BIT, BECAUSE I WASN'T LOOKING FORWARD TO CONVINCING PEOPLE TO CARE ABOUT THE UNIX 2038 PROBLEM.



If only we'd chosen 1944-12-02 08:45:52 as the Unix epoch, we could've combined two doomsday scenarios into one and added a really boring scene to that Roland Emmerich movie.

Explanation

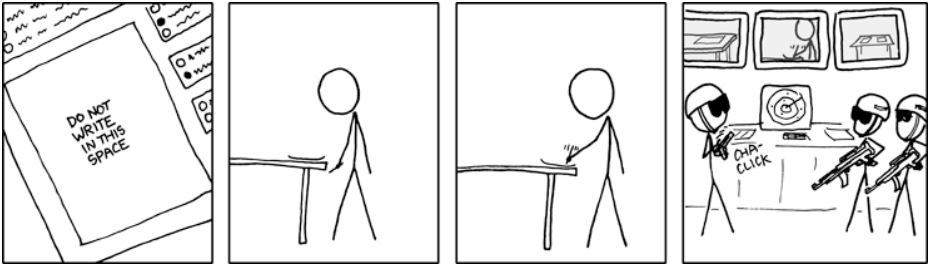
The 2038 problem is a well-known problem with 32-bit Unix-based operating systems. Unix time is stored as a 32-bit signed integer on these systems, counting the number of seconds since 1970. In 2038, we overflow the highest number we can store in signed 32-bit integers, leading to unexpected behavior. The switch to 64-bit operating systems will most likely be complete by the year 2038, which is why Randall is relieved. The reference to Y2K is a throwback to the year 2000 problem, in which people were concerned that computers storing years as two digits (e.g.: 99 to represent 1999) would cause problems when the year 2000 began because 00 could have been interpreted as 1900 by error. That Y2K issue was covered widely — with only some small mishaps — but calculating dates beyond 2038 is still not solved on many 32-bit UNIX based systems today. The "even WORSE" is possibly referring to how our increased reliance on computers means the bug could affect many more vital systems, but with Y2K passing by relatively uneventfully especially in light of the hype that preceded it caused people to take this sort of problem less seriously.

The title text is a reference to the film 2012 which is about the world ending in December of 2012, at the end of the Mayan calendar. If the designers of the UNIX operating system had used 1944 as their epoch instead of 1970, then the UNIX crash due to a variable overflow would coincide with the end of the Mayan calendar.

Thus, the implication is that there could have been a boring scene in the movie where the UNIX time rolls over and nothing happens and no one cares — because the world doesn't exist any more.

#608: Form

July 10, 2009



'This space intentionally left blank' is less immediately provocative but more Hofstadterially confusing.

Explanation

Application forms, examination papers, etc. sometimes instruct applicants to avoid writing in blocked out areas of the page, as those areas are intended for administrative, office, or internal usage or processing.

Nonetheless, a person might write in the blocked out section out of an urge to defy authority, as does Cueball in the comic. Consequences for flouting these instructions are typically trivial (e.g. perhaps the form may not be processed correctly). However, Cueball's disregard for the rules prompts the preparations for an armed response by some sort of law enforcement or private security organization, presenting a serious consequence for Cueball.

The title text refers to Douglas Hofstadter, an author associated with the philosophical concept of self-reference. "This space intentionally left blank" is "Hofstadterially confusing" because if a space on a form contains the words "This space intentionally left blank", then the space is not, in fact, left blank. In sufficiently pedantic organizations the phrase has been modified to some variation of "this space intentionally left mostly blank".

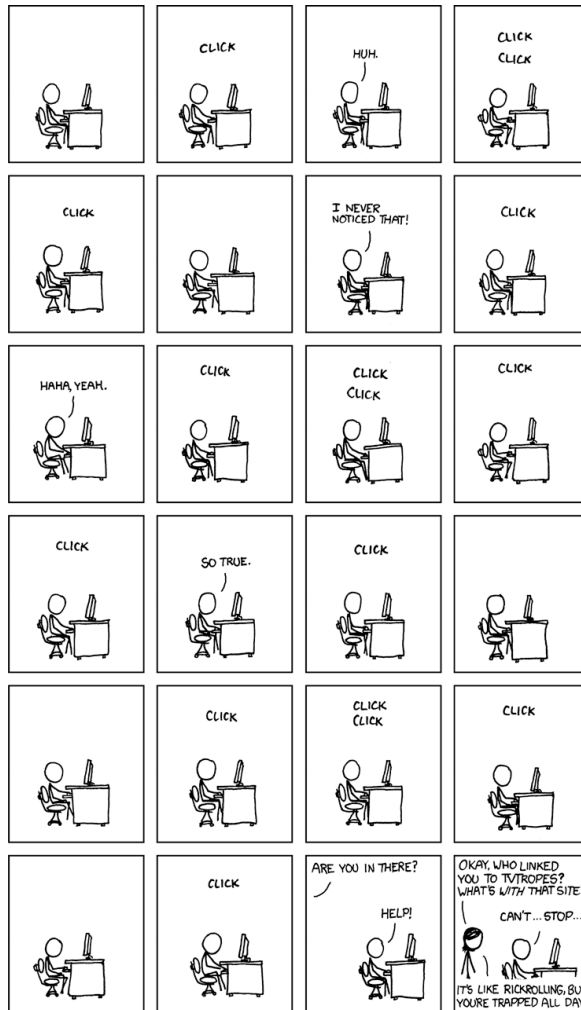
Douglas Hofstadter is also the subject of the comic 917: Hofstadter.

A similarly harsh consequence for a trivial misdemeanor

can be seen in both 292: goto and 499: Scantron.

#609: Tab Explosion

July 13, 2009



Cracked.com is another inexplicable browser narcotic. They could write a list of '17 worst haircuts in the Ottoman Empire' and I'd read through to the end, then click on all the links at the end.

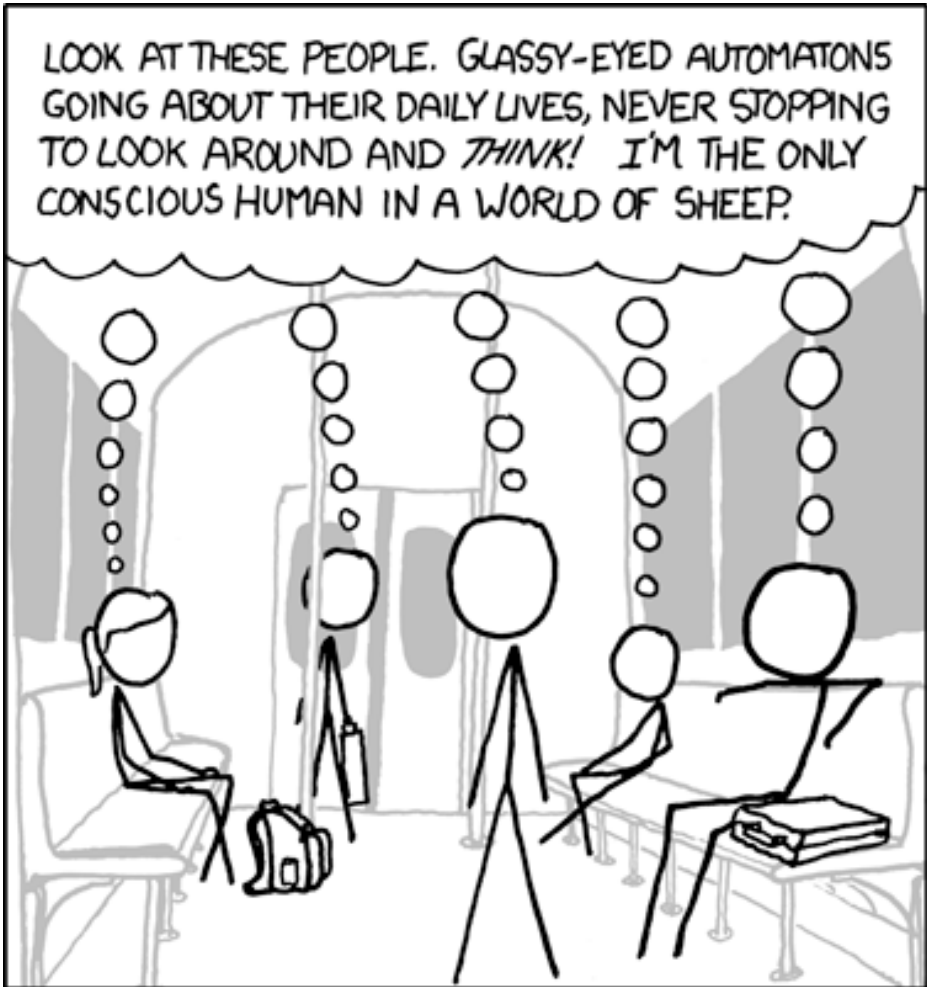
Explanation

TV Tropes is a popular site which allows conversation on tropes. A common joke with the site (and Wikipedia) is how you will read a page, find a certain trope, which will lead to you opening another tab on your web page in order to read after you're done with the original one. Then, as you read further down this article, and others, you'll open even more pages. Pretty soon, this will cause an extremely long cycle of opening new pages and closing old ones, not necessarily at the same rate. In the comic, this is exactly what happens to Cueball. He starts on a single page, then opens more and more tabs on different pages. Pretty soon, he finds himself stuck in a loop of opening pages. The last frame refers to Rickrolling, which is the practice of being linked to Rick Astley's "Never Gonna Give You Up" on YouTube.

The title text refers to the comedy site Cracked.com. This site is also known for its addictive articles. Most articles are formatted in the same way the title text notes. Eventually, Cracked itself wrote a column that paid tribute to this cartoon. (See the very last line With that in mind, we present to you the 17 Worst Haircuts in The Ottoman Empire.)

#610: Sheeple

July 15, 2009



Hey, what are the odds -- five Ayn Rand fans on the same train! Must be going to a convention.

Explanation

The people in this comic think of each other as sheep, blindly following directions without thinking for themselves. The word "sheeple" from the title has been used before in xkcd in the phrase "Wake up Sheeple!" In this comic, each person on the train considers themselves to be the only individual mind and everyone around them as "sheep". Ironically, the reader can see that although each of them thinks about how individual they are, they collectively think exactly the same thing, meaning that they are all sheeple. The comic can also be taken as a warning to not assume that you have more consciousness than someone else, since for all you know they could think the same about you.

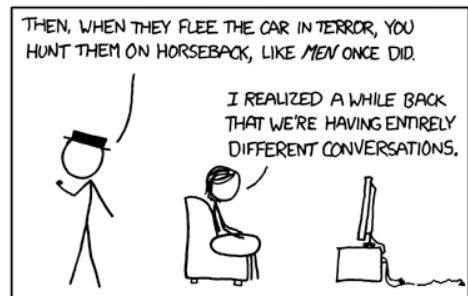
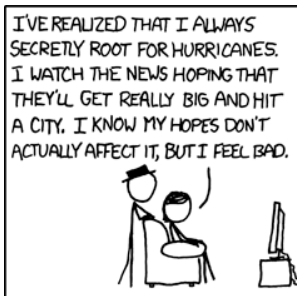
Ayn Rand was a Russian-born American novelist and activist whose most famous books include *Atlas Shrugged*, *Anthem*, and *The Fountainhead*. She developed a philosophy known as Objectivism, which promotes individual fulfillment (or so-called "rational self-interest") at the expense of collective goals and undertakings. Sheeple coordinates with Ayn Rand's novel, *Anthem*, set in the distant future in which the word "I" has been abolished and the evils of the communal values have created a new dark age.

A possible further irony can be found in the title text. Rand enthusiasts would seek individualism and independence from social pressures; however, a convention could be interpreted as a social collective of

people who have similar interests in a subject. These ideas could arguably be construed to be opposites of each other. However, similar interests do not mean a lack of individualism: this can be seen in Ayn Rand's novel "Atlas Shrugged", which features a society of like-minded people centered around the concepts of individualism and neoliberalism.

#611: Disaster Voyeurism

July 17, 2009



Hurricane forums are full of excited comments about central pressure and wind speed and comparisons to Camille and 1931 and 1938, with hastily-tacked-on notes about how it will be tragic if anyone dies and they hope it's a dud.

Explanation

The comic is referring to a phenomenon known as gaping or rubbernecking. The terms are applied to people who stand around as spectators at the site of a disaster. Apparently, many people are attracted to terrible scenes out of a sort of morbid curiosity. While fascinated by the spectacle, most people also feel a sense of shame and guilt at the same time, unsure of whether it is morally wrong to be entertained by other's misfortunes.

This feeling of conscience is expressed in the comic by Megan, who secretly cherishes hope that a hurricane might strike but feels guilt despite knowing she isn't the cause of any danger. Black Hat on the other hand regards these feelings as perfectly natural. In the comic, he gives three more examples of how he enjoys other people's misfortune, each more sinister than the last, eventually partaking in the disaster itself which is another thing entirely:

- Watching shuttle launches because you don't want to miss a disaster, referring to the Challenger shuttle explosion shortly after launch on January 28, 1986. This example is similar to Megan's scenario, where they're not doing anything illegal or not allowed.
- Dressing as an intern and sneaking into operating rooms to watch surgeries in case a patient dies, in hopes of watching organs be harvested. This is not allowed in

operating rooms[citation needed] and would be seen as socially unacceptable, but in this case he's not actually causing any harm. The organ harvesting could be a normal case of donating organs upon one's death, but could also be referring to illegal organ harvesting.

- Detour signs are usually used when there is construction down a main road; the signs direct drivers down a longer and more roundabout path. In this case, Black Hat uses stolen detour signs to direct cars down a much more dangerous path. His backwoods roads are strewn with caltrops, small weapons that have a spike pointed upward no matter how they are thrown. They were used in World War 2 to burst tires, and Black Hat plans to do the same thing to the unsuspecting drivers' car tires. He plans to then shoot at their windows and hunt them down on horseback. In this example, Black Hat would actually be causing the danger, potentially injuring or killing passengers in the car, which would be a very Black Hat thing to do.[citation needed]

It becomes clear that he actually enjoys it when other people are hit by tragedies. He reveals that he even actively promotes or causes the tragic fates of others. Him being a sadist concurs with the characterization depicted in other comics. Megan understands that the two of them are in fact leading entirely different conversations, as Black Hat is not in the least able to comprehend her scruples.

The title text aims at hurricane enthusiasts in internet forums, who are distracted by their scientific curiosity

from the danger a hurricane may present to humans. Hurricane Camille was a category 5 hurricane that occurred in August of 1969 with windspeeds of 280 km/h and caused a few hundred deaths in the United States, Cuba, and Mexico. The 1931 hurricane likely refers to the 1931 British Honduras hurricane, a category 4 hurricane with windspeeds of 215 km/h and resulted in 2,500 fatalities in British Honduras and Mexico. The 1938 hurricane is likely the 1938 New England hurricane, which was a category 5 hurricane with 260 km/h windspeeds that caused around 700 direct fatalities in the Northeastern United States. It would generally be considered inappropriate to express excitement about people's deaths, hence the hastily added notes stating that this isn't the goal of their comments.

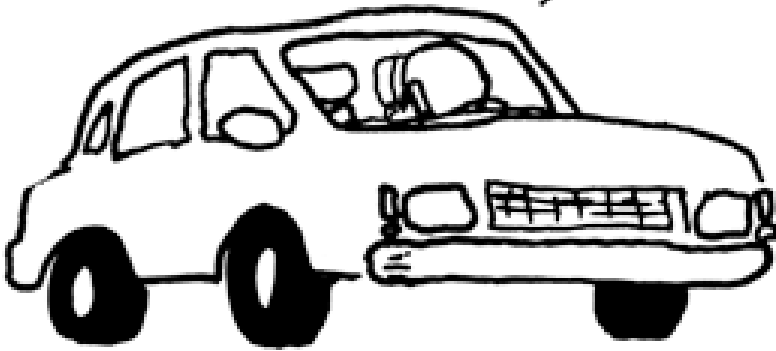
#612: Estimation

July 20, 2009

I'M JUST OUTSIDE TOWN, SO I SHOULD
BE THERE IN FIFTEEN MINUTES.

ACTUALLY, IT'S LOOKING
MORE LIKE SIX DAYS.

NO, WAIT, THIRTY SECONDS.



THE AUTHOR OF THE WINDOWS FILE
COPY DIALOG VISITS SOME FRIENDS.

They could say "the connection is probably lost," but it's more fun to do naive time-averaging to give you hope that if you wait around for 1,163 hours, it will finally finish.

Explanation

When moving or copying files using Windows Explorer, a dialog box opens to inform the user how long it would take. However, to the bafflement of many the time often keeps wildly fluctuating. This comic pokes fun at this quirk of Windows. One possible cause of this behavior is an estimation where the current transfer rate is given the most weight, which if we were to continue with the car scenario put forth by Randall, is like giving an ETA based on the speed the car is currently at with no consideration of the future, such as traffic lights, traffic jams, or expressways. File transferring is limited by various factors such as how fast the files can be read, how quickly the disk can be written to, and even the size of each file themselves (think the difference between carrying a large box versus having to carry a hundred miscellaneous items).

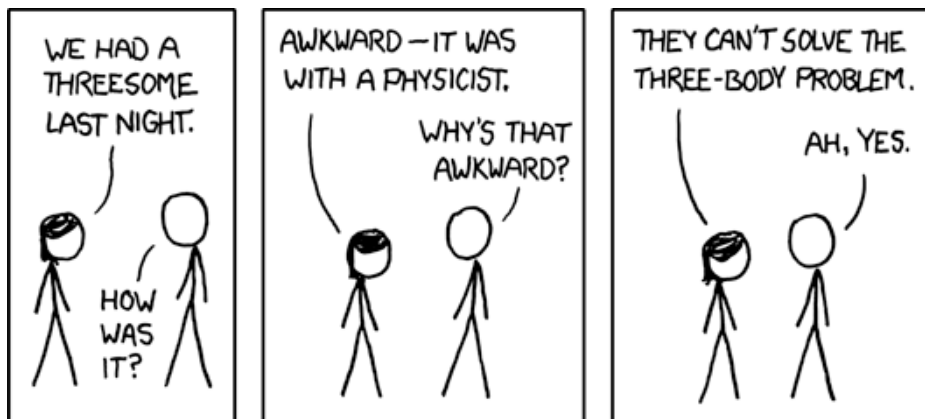
A better implementation would keep track of the average file transfer rate over the entire operation, which would even out the bumps and give a more accurate estimate. Windows 8 avoids the problem by doing away with the time estimate.

The title text refers to the fact that if the connection is lost, and data can no longer be transmitted, the estimation just gets larger and larger as time goes on rather than realizing that no data being sent means there is no connection. This is a behavior that occurs on Microsoft network connections even when the

connection is not lost. Kubuntu avoids this problem, but not that of wide fluctuations, by including only the past few seconds in its estimate. If there has been zero progress within the averaging interval, it reports "Stalled".

#613: Threesome

July 22, 2009



I wanted us to try finding an approximate numeric solution, but noooo.

Explanation

The N-Body Problem in physics refers to our inability to analytically solve sets of differential equations modelling gravitational attraction between more than two bodies. Simply put, there are exact equations for describing the movement of two bodies reacting to each other's gravitational pull, but no such solutions exist for systems of three or more bodies.

A threesome is a sexual encounter with three people. The punchline of the comic is a play on the word "bodies": a threesome involves three (human) bodies, and it is implied that the physicist's participation in the threesome was hindered due to their inability to solve for the movement of said bodies (i.e. the physicist was apparently unable to get comfortable and sexually satisfied at the same time).

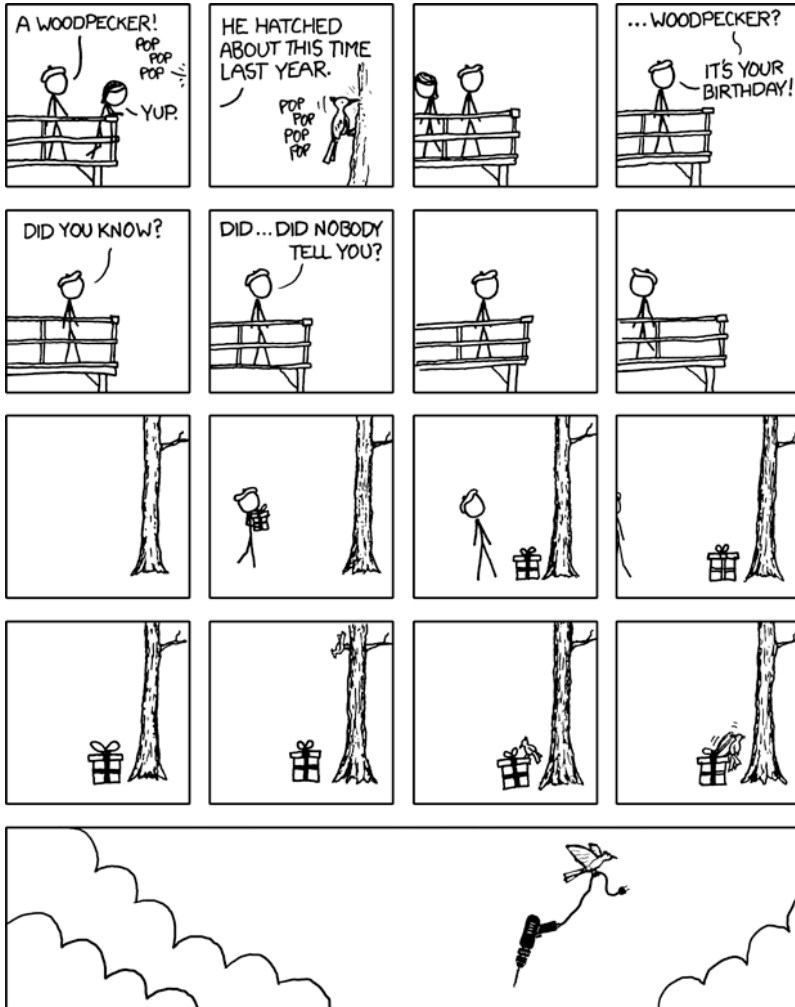
According to the title text, Megan proposed that they settle for a numerical solution since a closed-form solution is unavailable. A numerical solution to predict the motion of a system would be an "open" procedural solution or simulation. On the one hand, such a solution can be more practical and less time-consuming than a closed-form solution, especially in cases (such as the three-body problem) where the latter is suspected to be impossible. On the other hand, a numerical solution is only an approximation and will tend to deviate from the exact solution over time. In the context of the comic, Megan probably was suggesting that a numerical

solution would be sufficiently accurate for the duration of the threesome, but it appears that the physicist insisted that they arrive at an exact solution.

A frequent observation in random n -body encounters is that one or more bodies are ejected from the system by achieving escape velocity (and loneliness), but stable solutions are possible. A closed-form solution would allow one to predict for how long such an arrangement would remain stable. Ironically, it could be that the physicist's insistence on finding an exact solution resulted in them being excluded/"ejected" from the threesome, which arguably would be very "awkward".

#614: Woodpecker

July 24, 2009



If you don't have an extension cord I can get that too.
Because we're friends! Right?

Explanation

Beret Guy observes a woodpecker. A woodpecker is a type of bird known for using its bill to bore holes into trees to get access to and eat the insects living inside. Megan notes that the bird hatched approximately a year ago. Beret Guy seems touched by this fact, and attempts to explain to the woodpecker that it is the woodpecker's birthday.

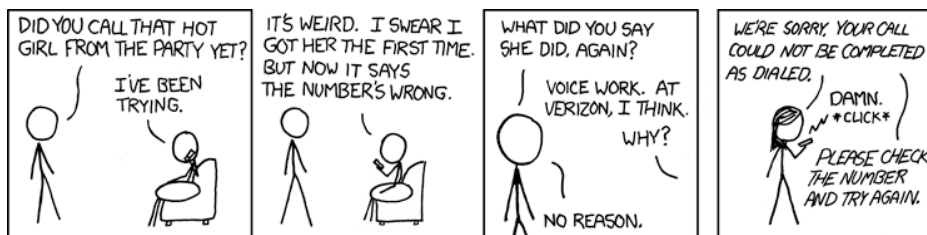
Beret Guy leaves a present by the foot of the tree where the woodpecker is nesting. The woodpecker opens the present which turns out to be a power drill, a mechanical tool that is used to bore holes into wood, much quicker than a bird normally could. Not that this would be of much use to the bird, as the bird has no electricity[citation needed] and so no means of powering the drill, let alone opposable thumbs[citation needed] with which to operate the drill. In spite of this, the woodpecker has not only unwrapped the present; it has apparently accepted it, and flies off with it. However, this is Beret Guy who gave the woodpecker the drill. He may have given it some other means of working without electricity.

The title text appears to be Beret Guy talking to the bird still, pointing out that he can get the bird an extension cord to operate the drill because, in his mind, they are friends. In actuality, the bird may or may not care about the drill or Beret Guy. An extension cord, also, would not do much good as the bird would still have no

electricity, and if it did have a source of electricity and was able to use the drill, it wouldn't be able to fly further than the length of the extension cord, which isn't far for a bird. This could be a reference to 509: Induced Current.

#615: Avoidance

July 27, 2009



Hobby: seeing how many menu selections you can get someone to go through before they realize you're not an automated system and/or hang up.

Explanation

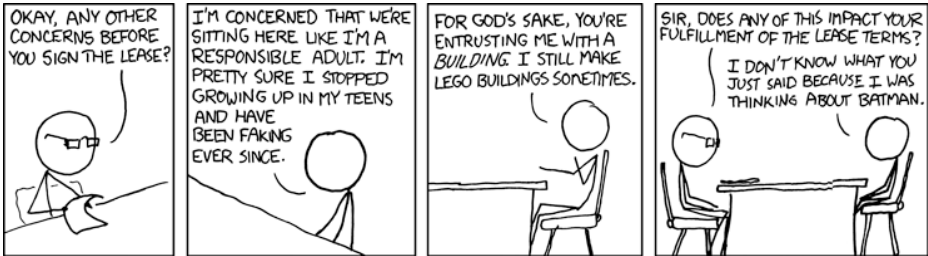
Megan gave her number to Cueball at a party, but now doesn't want to talk to him. Because Megan works with recording voice messages at Verizon, she can with no effort put on the characteristically semi-lifeless tone of professional automated answers and answer the phone with the "call cannot be completed"-message. Perhaps it was even she who recorded it in the first place. In this way she avoids Cueball, hence the title.

Cueball actually got through to her the first time he used her number, and since she did not know his number at the time, she took that call. After that she used her Verizon voice every time he calls. Cueball's friend is suspicious, and he asks if Cueball knows what Megan works with. He gets his suspicion confirmed but seems to enjoy that Cueball hasn't understood the implications and doesn't let him in on the secret.

The title text mentions a possible hobby that Randall could think of. The hobby can be interpreted as a Reverse Turing test with someone imitating an Interactive voice response system to see how long they can keep this going before the caller either gives up and hangs up, or realizes someone is making a joke on them and calls them out. This is related to Randall's My Hobby series, but this time it is not specifically Randall's own hobby.

#616: Lease

July 29, 2009



You should talk to the girl down the hall; I think you'd like her. Lemme know if you find out why she's ordering all those colored plastic balls.

Explanation

Cueball is about to sign a lease to rent a building, but he's scared that he's not grown-up enough for the responsibility, presenting as evidence that he still plays with Lego building blocks.

It's common for children to assume, on some level, that adults are all capable, even infallible, and have all the knowledge they need to navigate the adult world. As a result, there's often a subconscious assumption that you'll reach a point where you feel like an adult, with all the attendant knowledge and maturity. The reality is that maturation is a process, knowledge is gained over time (and often through harsh experience), and the immaturities of youth never spontaneously vanish. Most people learn to behave in ways that adult society expects of them well before such behavior comes naturally, and for some people it never does. This is probably the source of Cueball's comment that he "stopped growing up" as a teenager and has been "faking it ever since".

Of course, Cueball actually isn't responsible and capable, since he drifts off to think about the fictional character Batman (who appears in comic books, often considered children's material), in the middle of a serious financial transaction.

The title text references one of xkcd's most famous comics, 150: Grownups, where Megan decides to use the freedom of adulthood to fill her apartment with playpen

balls. It is possible that this is a prequel to the events in that comic. After the events in this strip occur Cueball may have moved into the building where Megan lives, gets to know her and one day when he goes to see her, the events in that strip take place. From the title text we see the lender can tell that Cueball would like Megan and from the events of Grownups we see that a romantic relationship of some sort did form.

#617: Understocked

July 31, 2009



My biology grad student friends tell me that different types of alcohol don't actually have different effects. I trust their expertise, not because of the 'biology' part, but because of the 'grad student'.

Explanation

On July 16, 2009, Harvard University professor Henry Louis Gates was arrested at his home in Cambridge, Massachusetts by police officer Sgt. James Crowley, after the police department received a call that Gates and another man were breaking and entering into the residence. Returning home from a visit to China, Gates had found his front door jammed, and tried to force it open with the help of his driver.

Arriving at the scene and finding the front door forced open, Crowley (a Caucasian) asked the African-American Gates to show his ID or other proof that he lived there. Gates, feeling persecuted, responded with belligerence. He presented identification, but continued to talk back to the officers. Sgt. Crowley arrested Dr. Gates and charged him with disorderly conduct. The charges were dropped on July 21, but the incident sparked a national debate about racial profiling.

On July 22, U.S. President Barack Obama criticized the arrest, saying that the Cambridge police "acted stupidly in arresting somebody when there was already proof he was in his own home." He also commented on the racial undertones of the incident, saying that "there is a long history in this country of African-Americans and Latinos being stopped by law enforcement disproportionately. That's just a fact."

The president's remarks were furiously criticized by the

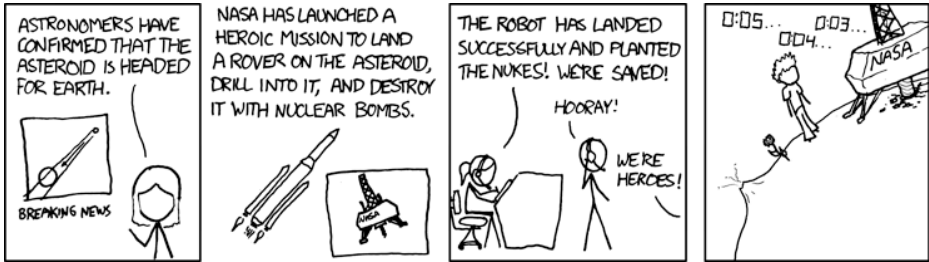
law-enforcement community, and President Obama apologized two days later, saying that he could have chosen his words better, and it wasn't his intention to malign the Cambridge Police Department or Sgt. Crowley. He also invited Gates and Crowley to discuss the situation over beers to air out their differences and come to an understanding about the situation.

This comic explores a hypothetical situation in which President Obama found he was all out of beer, and chooses to share tequila with Gates and Crowley instead. In pop culture, tequila is frequently represented as the "let's-get-trashed" alcohol of choice, and so in the comic, President Obama, Professor Gates and Sgt. Crowley all get trashed on tequila, take a White House limo on a joyride, and all end up behind bars.

The title text goes back on the suggestion that drinking tequila rather than beer would cause this kind of behavior. It also jokingly implies that biology grad students are authorities on the effects of alcohol because they drink a lot, not because they understand how the human body works.

#618: Asteroid

August 03, 2009



My Deep Impact/Little Prince crossover fanfic has been poorly received by the community.

Explanation

The comic begins with Blondie as a news anchor reporting that an asteroid is headed for Earth.

The end of the world has been envisioned in many ways. One of the most common is with a really big rock hitting Earth. This has been depicted in movies several times, most famously, and released in the same year, are Armageddon and Deep Impact, but also The Day the Sky Exploded and many more. These lists of films with asteroids and meteors show how popular this theme is.

There is an online calculator for asteroid impacts, but don't worry, as any rock that does hit Earth isn't likely to kill everyone. And, as seen in the what if? article Diamond, speed counts too.

The joke here, though, is that, after sending up a robot to blow the asteroid to smithereens, said rock is actually the home of the Little Prince from the famous tale by Antoine de Saint-Exupéry. To save our world, we must destroy his. And probably the prince along with it. If the only way to save our species is by killing off another species, is the act still ethical? In none of the world-destroying asteroid stories were said rocks actually home to intelligent life. Or any life, for that matter. A second joke that can be seen is that in said movies the "heroic" mission always involves humans in some way imperiling themselves to save humanity, rather than, say, staying safely at home and using a robotic rover to do all

the dangerous stuff.

The title text is a reference to the 1998 asteroid movie *Deep Impact*. "Crossover" is a term used to refer to a technique of taking two independent (and usually already existing) stories and creating a scene or short story in which characters from both worlds collide and interact with each other. Or, in other words, characters from one story "crossover" into the second. Fanfic is short for Fan Fiction, e.g. a fictional story written by someone who loves a particular story/series/idea so much they wanted to write their own tale about it (or one who hated said story so much they felt compelled to fix it). It suggests that most people were unwilling to read a story about people nuking miniature kingdoms to save civilization. A tough entertainment call any day.

The Little Prince was referenced already back in 2: *Petit Trees* (sketch), later in 1350: *Lorenz* at the end of the space trip branch, and in 2712: *Gravity on B-612* as a carbon copy of this comic.

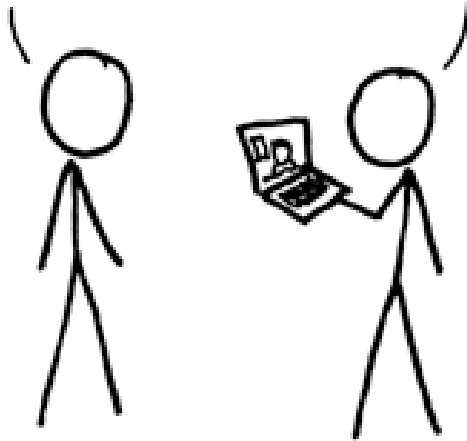
#619: Supported Features

August 05, 2009

IT TOOK A LOT OF WORK, BUT THIS
LATEST LINUX PATCH ENABLES SUPPORT
FOR MACHINES WITH 4,096 CPUs,
UP FROM THE OLD LIMIT OF 1,024.

DO YOU HAVE SUPPORT FOR SMOOTH
FULL-SCREEN FLASH VIDEO YET?

NO, BUT WHO USES THAT?



I hear many of you finally have smooth Flash support, but me and my Intel card are still waiting on a kernel patch somewhere in the pipeline before we can watch Jon Stewart smoothly.

Explanation

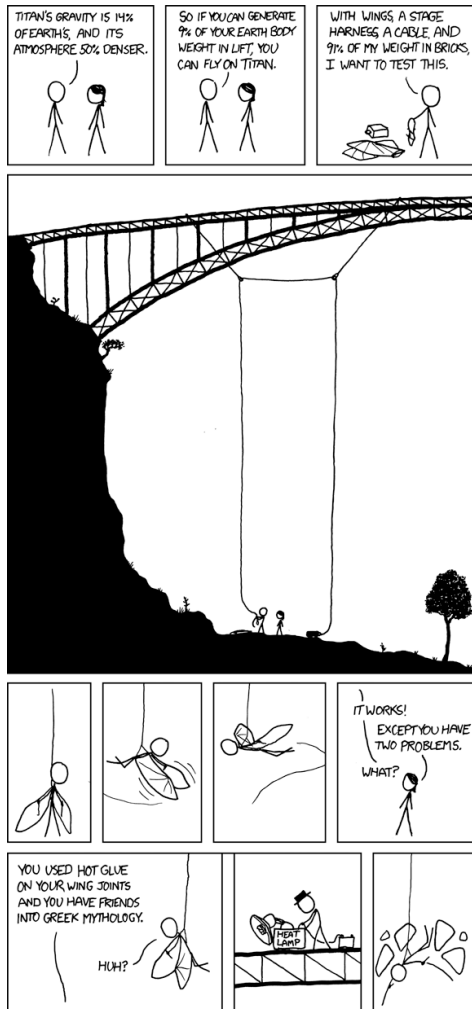
This comic references how Linux builds overly focus on adding support and features that will not appeal to the majority of desktop computer and Linux users, and the general dismissive attitude of those who point this out. One Cueball has created a patch that allows support for processors with 4,096 cores, even though most computers have only 16 cores or fewer. He considers this to be more worthwhile an endeavor than full-featured Flash support that the other Cueball is concerned about. The former attempts to claim that coding for the latter is unnecessary, even though Flash was the most common way to present videos or animations on websites at the time when this comic was published.

Ironically though, in the years since, there exist computer systems that have well over 4,096 cores, while Flash usage has dwindled to practically zero with even the company dropping official support by 2020, having been superseded by HTML5. Many of the world's datacenters, particularly supercomputers, run Linux. These developments took roughly a decade, but it nonetheless means our initial Cueball is the more prescient party in this arrangement with a very future-proofed machine. On the gripping hand, however, hardware accelerated HTML5 video itself is intentionally broken by default on Linux for most popular combinations of web browser and GPU driver, due to uncooperative policies from the developers of one or both.

The title text mentions the "American political satirist, writer, director, television host, actor, media critic, and stand-up comedian" Jon Stewart which further refers to his famous American late night satirical television program The Daily Show. The show is also available on the internet (www.thedailyshow.com), presented (at least at that time) in Flash video.

#620: Wings

August 07, 2009



Please do not try any of this and die or get arrested.

Explanation

Cueball explains to Megan that on Saturn's moon Titan, the combination of lower gravity and a denser atmosphere make the act of flying simpler. Wings that are only capable of generating 9% of the necessary lift on Earth would allow one to fly if used on Titan.

Cueball now stands in front of an apparatus to do so; he is standing in a valley with a metal arch above him, and two pulleys that have a rope going from Cueball to one pulley to the other and to the pile of bricks that weigh 91% of his weight, so if he generates enough lift to cancel out 9% of his weight, then he will be able to lift himself and fly.

The experiment is a success. However, as Megan points out, his experiment has some problems, namely that he used hot glue for the wing joints and that he has friends into Greek mythology.

Icarus is a Greek character known for his self-powered flight, which ended when the wax holding his wings together melted due to the sun's heat, and he fell to his death. This supposedly occurred because he ignored instructions not to fly too close to the Sun, a tragic example of hubris — extreme arrogance. Here, Black Hat is bringing an artificial "sun" to "Icarus" to recreate the tragedy.

Black Hat is standing on top of the arch with a powerful

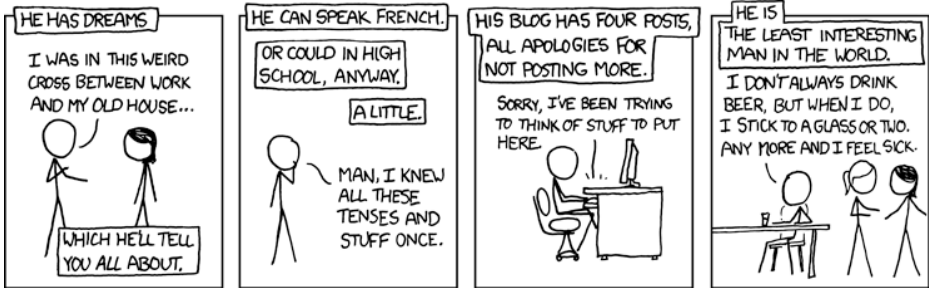
heat source, a heat lamp. The hot glue melts, then the wings fall apart, then Cueball falls.

In the title text, Randall asks that xkcd readers do not attempt to reproduce this. The reason for this is explained here. It could also simply be a media-standard "Don't try this at home" warning, as there are legitimate dangers to flying around unprotected. Sufficient height and a sudden loss of one's wings could indeed result in death (and deliberately causing someone to lose their wings and die or be injured would indeed get one arrested).

One thing to note about this comic is that Cueball is still attached via pulley to the bricks. These bricks, weighing down on the other side, should (obviously) slow his fall considerably. Of course, Black Hat could also cut the rope...[citation needed]

#621: Superlative

August 10, 2009



Stay while I recount the crazy TF2 kill I managed yesterday, my friends.

Explanation

The comic parodies a famous advertisement campaign for the Dos Equis beer brand. In the campaign, Jonathan Goldsmith plays "The Most Interesting Man in the World", a suave elderly gentleman with a number of astonishing life experiences and skills. The campaign's format generally includes the narrator presenting hyperbolic descriptions of the man's accomplishments, followed by the man delivering his signature catchphrase, "I don't always drink beer, but when I do, I prefer Dos Equis.", which has been widely adopted as an internet meme.

Cueball plays the antithesis of the protagonist in the campaign: the least interesting man in the world. Unlike the stories in the advertisement, his affairs tend to bore the listeners. Being the generic everyman, he possesses no outstanding capabilities at all. While the original is said to "speak French... in Russian", Cueball seems to have forgotten his French altogether. He also has apparently nothing of interest to tell, either in real life or in his blog. Instead, he will talk away about his weird dreams and his success in video games. Moreover, he is unable to stand too much beer and therefore absolutely ill-qualified to advertise it.

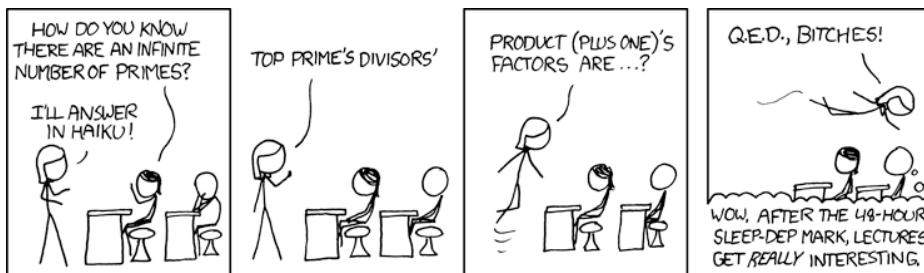
A superlative is a form of description that conveys the quality of being an extreme example (typically the most or least, in some way), and while the comic makes clear that this individual is not extraordinary in so many ways,

his sheer blandness and lack of any exceptionalism is (in its own way) a very extreme position, hence the title describing this obviously unsuperlative individual as "Superlative", though there may be a small complication to this viewpoint that is related to the thwarted search for 'boring' numbers.

The title text is a reference to the slogan of the campaign "Stay thirsty, my friends." It also references Team Fortress 2 (TF2), a multi-platform, multi-player first-person shooter game.

#622: Haiku Proof

August 12, 2009



After somewhere around 40 hours, there's no academic reason to go to the class. Only go for the hallucinations.

Explanation

In this comic Cueball attends a math class after having been awake for two full days (48 hours). After that he begins to hallucinate and dreams that the teacher Miss Lenhart (a professor in this comic) answers Megan's question, about a proof that there are an infinite number of prime numbers, in haiku. After the first line she floats up and during the third and final line she flies over the students heads. Note also that when Cueball looks up at the flying teacher when she takes off, Megan never moves her head because it's not happening in her world, and Cueball only hallucinates that the teacher flies.

Euclid's theorem states that there are an infinite number of primes, prime numbers being numbers that are only divisible by themselves and 1. The most notable proof of this theorem, and the one presented in this comic, was first given by Euclid himself in his Elements. A more traditional form of this proof follows:

At the last line of the haiku, Miss Lenhart says "Q.E.D., bitches!", Q.E.D. stands for "Quod Erat Demonstrandum", which means "Thus, it has been demonstrated." This is a Latin phrase which is used to show a proof is over. Ironically, the proof is not complete.

The comic essentially takes this proof and states it in the form of a haiku, which is a traditional form of Japanese poetry, which is in Japanese broken up into patterns of

morae (or syllables), a unit that measures the length of sound. A Japanese haiku consists of three lines with 5, 7 and 5 morae respectively per line. An English Haiku has 5, 7 and 5 syllables per line. The proof poem goes like this:

Which can be divided in syllables like this:

The haiku proof given is slightly off, as the first line talks about the "top prime's divisors," which makes no sense because the top prime doesn't have any divisors besides itself and one. You need to take the product of all primes, not just one. But, hey, it's a hallucination. The haiku could be made to more closely resemble the actual argument while retaining haiku structure by replacing the first line with "Assume primes finite."

Haiku was also referred to before in 554: Not Enough Work.

The comic and title text conclude that going to class while sleep-deprived is an interesting, but entirely noneducational, experience. So, go for the sake of the hallucinations.

#623: Oregon

August 14, 2009

HISTORY of 19 th -CENTURY OREGON	HISTORY of 19 th -CENTURY OREGON	HISTORY of 19 th -CENTURY OREGON
<p>1804 ARRIVAL OF LEWIS & CLARK 1812 EARLY SETTLERS ARRIVE 1814 OREGON TRAIL ESTABLISHED 1815 LARGEST WESTERN IMMIGRATION ROUTE 1844 HUGE WAVE OF SETTLERS + SETTLERS ARRIVES FROM PACIFIC NORTHWEST, LARGELY CHILDREN AND ADVENTURERS, FOOT DRINK NOTHING BUT CEREALS OF BULLETS FOR HUNTING</p> <p>1849 OVERHUNTING BEGINS TO DEGRADE ECOSYSTEM DYSENTERY EPIDEMIC 1850 CHOLERA BEGINS ENVIRONMENT THINDED EPIDEMIC THINDED EPIDEMIC CHOLERA EPIDEMIC 1851 ALL FISHING UNDER TOWN SMOKEWELLS WIPED OUT BY OVERHUNTING FISHING THIN 1852 LAST SURVIVORS FLEE OREGON TERRITORY ABANDONED</p>	<p>1804 ARRIVAL OF LEWIS & CLARK 1812 EARLY SETTLERS ARRIVE 1814 OREGON TRAIL ESTABLISHED 1815 LARGEST WESTERN IMMIGRATION ROUTE 1844 HUGE WAVE OF SETTLERS + SETTLERS ARRIVES FROM PACIFIC NORTHWEST, LARGELY CHILDREN AND ADVENTURERS, FOOT DRINK NOTHING BUT CEREALS OF BULLETS FOR HUNTING</p> <p>1849 OVERHUNTING BEGINS TO DEGRADE ECOSYSTEM DYSENTERY EPIDEMIC 1850 CHOLERA BEGINS ENVIRONMENT THINDED EPIDEMIC THINDED EPIDEMIC CHOLERA EPIDEMIC 1851 ALL FISHING UNDER TOWN SMOKEWELLS WIPED OUT BY OVERHUNTING FISHING THIN 1852 LAST SURVIVORS FLEE OREGON TERRITORY ABANDONED</p>	<p>1804 ARRIVAL OF LEWIS & CLARK 1812 EARLY SETTLERS ARRIVE 1814 OREGON TRAIL ESTABLISHED 1815 LARGEST WESTERN IMMIGRATION ROUTE 1844 HUGE WAVE OF SETTLERS + SETTLERS ARRIVES FROM PACIFIC NORTHWEST, LARGELY CHILDREN AND ADVENTURERS, FOOT DRINK NOTHING BUT CEREALS OF BULLETS FOR HUNTING</p> <p>1849 OVERHUNTING BEGINS TO DEGRADE ECOSYSTEM DYSENTERY EPIDEMIC 1850 CHOLERA BEGINS ENVIRONMENT THINDED EPIDEMIC THINDED EPIDEMIC CHOLERA EPIDEMIC 1851 ALL FISHING UNDER TOWN SMOKEWELLS WIPED OUT BY OVERHUNTING FISHING THIN 1852 LAST SURVIVORS FLEE OREGON TERRITORY ABANDONED</p>

A century later, the harrowing flight of the survivors from Oregon was dramatized in a popular video game.

Explanation

This comic relates to the computer game The Oregon Trail, and humorously depicts the consequences to real-world Oregon if everyone had arrived in the same manner they did in the game.

The Oregon Trail was an educational computer game released in 1971, but the version referred to is likely the more popular 1985 version. In the game, players would play as a character taking a trek west along the Oregon Trail from Missouri to Oregon. The player's journey starts in 1848 and typically takes less than one year to complete. Along the way, the player must manage resources (food, spare parts, etc.) and face risks and dangers (starvation, disease, etc.). Most players at the time were grade-school students. The game was very popular, and thousands of players played it monthly.

The game made it very easy to hunt for food. Large animals (bison, bears, etc.) were very easy and rewarding targets, where spending a single bullet could be enough to collect enough food for multiple days. There were also smaller prey available (rabbits, squirrels, etc.) which were harder to catch and provided less food. Since bullets are much lighter and cheaper than food, it was a good strategy to bring the minimum amount of food and plan to hunt for meals. Extra food can even be traded for money or other supplies, so it wasn't necessary to start the journey with anything except bullets.

Another aspect of hunting was that it made it fun to try to kill every animal available. You could end a hunt at any time, but if you played until time expired, you could amass thousands of pounds of food in a single hunt; a single buffalo could net 1,000 pounds. The game would then give a message like, "You collected 4,000 pounds of food, but you could only bring 100 pounds back." The discrepancy was amusing to grade schoolers, who would practice shooting as much game as possible.

Sample image:
<https://www.mnopedia.org/sites/default/files/styles/xlarge/public/huntingscene.jpg>

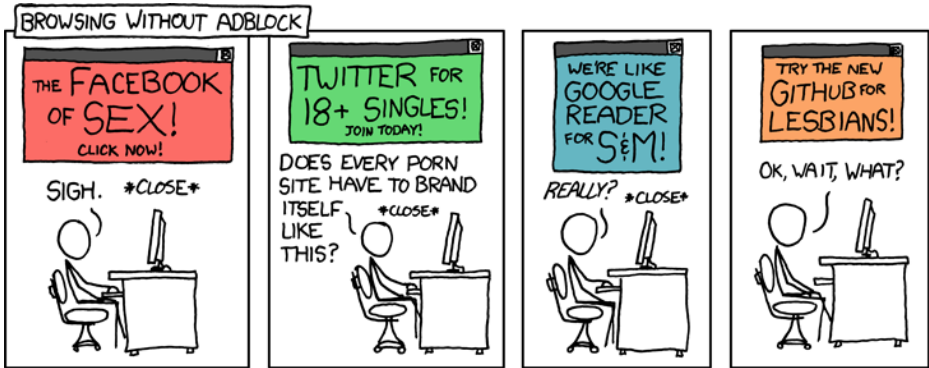
The comic tries to document, as though in a historical fashion, what would have been the result if all the players had been real settlers who really had prepared for their journey on the Oregon Trail in that way. The parts before 1848 are historically accurate. Starting from 1848, however, players of the game would form an unbelievably large influx of people arriving nearly simultaneously, with very little food or supplies being brought along. Massive overhunting would soon strip the land bare, all large game slaughtered for meat, with hunger, starvation and disease soon to follow. Dysentery in particular was very common in the original game and perhaps the most infamous way to die, hence its listing as the most prominent epidemic.

The title text makes things rather recursive. In this alternate reality, thousands upon thousands of people fleeing from the overpopulated, devastated Oregon

becomes the focus of another video game, much like The Oregon Trail in our universe.

#624: Branding

August 17, 2009



Actually, 'RSS&M' is kinda catchy.

Explanation

This comic pokes fun at web sites (adult-themed sites in particular) which try to inflate their popularity by comparing themselves to other popular online services. The strip shows four such advertisements that appear to Cueball as he browses the Internet.

Adblock is a browser extension which prevents advertisements from being displayed. Presumably Cueball normally browses the Internet with Adblock enabled, and thus would not see any of these ads.

The first advertises a website that brands itself as the "Facebook of sex". Because Facebook was ubiquitous at the time of writing, this is a good branding idea. Facebook is known to most users and connotes an easy-to-use platform where it's very easy to find people, chat with them, share pictures, etc. For someone looking for sex, this would probably seem like a good site to use. There are, in fact, sites that use this branding in their advertisements and/or their user interface which is likely what inspired Randall to write this comic. Cueball sighs and moves on, probably having seen this kind of ad many times already.

The second brands itself as "Twitter for 18+ singles". It is a similar but seemingly invented ad which again plays on the ubiquity and popularity of Twitter, which is a (generally) public chat forum. Despite the fact that, at the time this comic was published, it was limiting posts

to 140 characters, it was still popular enough to get some attention and make someone think about going to the site. Sending messages to the world in 140 characters or less might be somewhat less of a versatile platform than Facebook for chatting with other singles, but still perhaps viable. Cueball notes that it is becoming more and more popular to brand adult sites by comparing them to popular non-adult sites.

This third takes a turn for the unusual, branding itself as "Google Reader for S&M". Google Reader is a now-defunct platform that allowed users to aggregate web feeds such as RSS feeds into one place for convenience. The service is notably less well-known and popular than Facebook or Twitter, and given that it doesn't directly link you with other people, doesn't have the same connotation of allowing you to connect with others. Perhaps it would be a site that allowed you to aggregate various fan fictions, blogs, or other written works relating to S&M. However, Cueball is surprised such a site would exist.

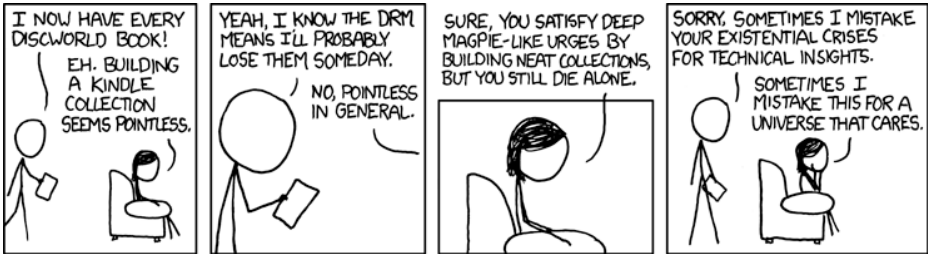
The final ad brands itself as a "GitHub for lesbians". GitHub is a website that allows developers to collaborate on software projects using the Git revision control system. The concept is absurd — GitHub has a specialized function unrelated to anyone's gender or orientation, and it's barely a social network at all; the usefulness or appeal of such a system made specific to lesbians is not apparent.[citation needed] Cueball is surprised and possibly even intrigued by this last ad. This should also be seen in a historical context: GitHub

launched in 2008, this comic was released a year later. At that point, Git was still relatively uncommon and GitHub was a niche within a niche, making this an extremely targeted ad.

The title text relates to the third panel. RSS is a technology involved in Google Reader. RSS&M is a portmanteau of RSS and S&M. This is a possible way for the third web site to brand itself.

#625: Collections

August 19, 2009



You know what really helps an existential crisis?
Wondering how much shelf space to leave for a Terry Pratchett collection.

Explanation

Cueball enters, excited that he's managed to buy every one of author Terry Pratchett's Discworld books for his Kindle e-reader. Megan says that it seems pointless to her to build a Kindle collection.

Cueball interprets this to mean she thinks it's pointless to build a collection on an electronic device, perhaps due to the DRM (digital restrictions management) software common on these devices which can (for instance) make it difficult to transfer the files if the device breaks. (This was the subject of 488: Steal This Comic and DRM has been the general subject of many xkcd comics.)

However, Megan is actually commenting on the futility of building up any kind of collection at all, since nothing we do can change the fact that we're inevitably going to die. And when we die, we always die alone - i.e. no one else can follow you on that last journey. And no matter how much you have collected (or earned) during this life that will not change. (A magpie is a bird traditionally thought to be drawn to collect shiny objects and bring them back to its nest.)

This view is in line with those advanced by the philosophical movement known as existentialism which theorizes that life has no deep, hidden meaning and hence even things that we personally feel are meaningful (like building up collections) will not change the outcome of life in the end.

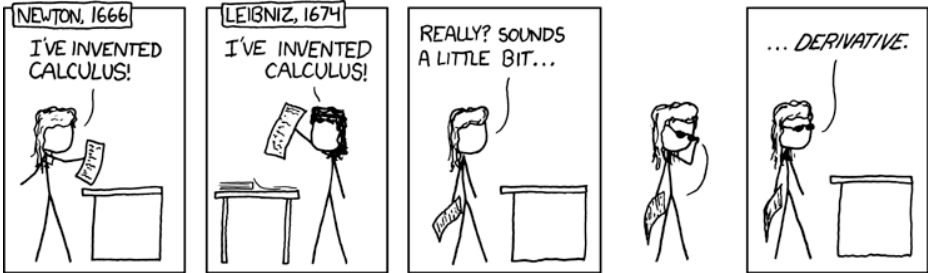
Cueball obviously has seen Megan in such moods before (see 220: Philosophy), and excuses himself for not noticing immediately (in the first panel) by the fact that he sometimes mistakes her existential crisis as technical insight. Megan deepens her crisis by pointing out that she sometimes makes the mistake to think that the universe cares. This is a disguised criticism of Cueball's behaviour, meaning that she would rather want him to care about her existential crisis, instead of simply brushing them off.

The title text points out that Wondering how much shelf space to leave for a Terry Pratchett collection. (That would then be all his works not just the Discworld series...) is an excellent way to get out of an existential crisis

By the time of his death Pratchett had written 41 Discworld books and more than 70 books in total. The day after Pratchett died Randall made a tribute comic to his memory in 1498: Terry Pratchett.

#626: Newton and Leibniz

August 21, 2009



YEEEEEEAAAAAHHHHH!

Explanation

Isaac Newton and Gottfried Leibniz both developed calculus independently of each other about eight years apart, as it says in the comic. However, although Newton had begun working on calculus before Leibniz, he didn't publish it, and Leibniz was the first to publish it (see the Leibniz–Newton calculus controversy).

In calculus a derivative is the result of mathematical differentiation: the instantaneous rate of change of a function relative to its argument, and denoted $df(x)/dx$. As taught in schools, if a function is drawn as a graph, the derivative of that function at a given point is equal to the slope of that graph at that point. However, the literary word derivative means developed from something older or copied/adapted from others, as Newton claims is the case here.

The pun is that Newton is claiming that Leibniz's mathematical derivative is a derivative, or descendant, from his earlier development of this calculus.

The comic as a whole is mocking the pattern of corny one-liners that David Caruso often spurts out during the opening scenes of CSI: Miami. The one liner is followed by him dramatically pulling off or putting on his sunglasses and then the show breaks into the title sequence which starts with Roger Daltrey singing an extended "YEEEEAAAAAAAH", from the song Won't Get Fooled Again by The Who as noted in the title text.

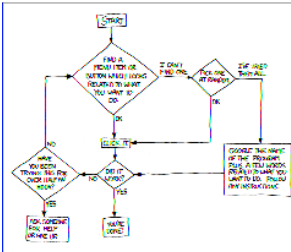
This has become a popular Internet meme and was used frequently with Michael Jackson's death. The sunglasses joke was also used in the title text of 977: Map Projections. The counts of each letter (Y E A H) in the scream are 1, 6, 6, and 6, which combined produce the year in which Newton is credited to have discovered calculus.

#627: Tech Support Cheat Sheet

August 24, 2009

DEAR VARIOUS PARENTS, GRANDPARENTS, CO-WORKERS,
AND OTHER "NOT COMPUTER PEOPLE":

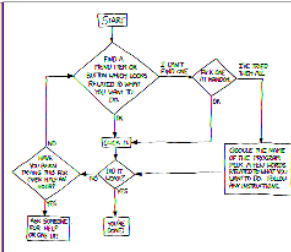
WE DON'T MAGICALLY KNOW HOW TO DO EVERYTHING IN EVERY
PROGRAM. WHEN WE HELP YOU, WE'RE USUALLY JUST DOING THIS:



PLEASE PRINT THIS FLOWCHART OUT AND TYPE IT NEAR YOUR SCREEN.
CONGRATULATIONS, YOU'RE NOW THE LOCAL COMPUTER EXPERT!

DEAR VARIOUS PARENTS, GRANDPARENTS, CO-WORKERS,
AND OTHER "NOT COMPUTER PEOPLE":

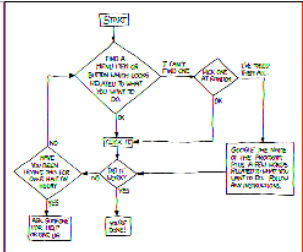
WE DON'T MAGICALLY KNOW HOW TO DO EVERYTHING IN EVERY
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PLEASE PRINT THIS FLOWCHART OUT AND TYPE IT NEAR YOUR SCREEN.
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DEAR VARIOUS PARENTS, GRANDPARENTS, CO-WORKERS,
AND OTHER "NOT COMPUTER PEOPLE":

WE DON'T MAGICALLY KNOW HOW TO DO EVERYTHING IN EVERY
PROGRAM. WHEN WE HELP YOU, WE'RE USUALLY JUST DOING THIS:



PLEASE PRINT THIS FLOWCHART OUT AND TYPE IT NEAR YOUR SCREEN.
CONGRATULATIONS, YOU'RE NOW THE LOCAL COMPUTER EXPERT!

'Hey Megan, it's your father. How do I print out a flowchart?'

Explanation

The main point of this comic is that many tech-savvy people may not know much about computers (and certainly don't automatically know how to do everything someone may want help with). They just have developed an intuition which works in many situations. This intuition is shown here in the form of a diagram. In particular, the chart exposes the computer expert's secret ingredient: trial and error.

A flowchart is an organizational tool for showing process flow. A box is an instruction, a diamond indicates a question, and the arrows control the flow from one symbol to another. Other flowchart comics can be found [here](#).

The title text is a sad admission that even knowing the procedure for how to fix the problem, many people will not follow it and still call their presumably more tech-savvy children. (In a minority of cases, it may be that the person did try to follow it, and still ended up at the "Ask someone for help or give up" step.) In this case the father of Megan calls her to help print the flowchart to put near his computer so he can be the computer wiz...

This is one of the cases where the name Megan is used, without the character Megan being drawn in the comic.

#628: Psychic

August 26, 2009



You can do a lot better than 1% if you start keeping track of the patterns in what numbers people pick.

Explanation

A psychic is a person who is supposedly able to access information that is beyond normal sensory perception through extrasensory perception. This information may vary widely in scope and value, ranging from archaeological to the ability to read minds. Cueball describes himself as such a person, to which Megan responds with disbelief because it is a bold and unsupported claim. To prove his abilities, Cueball has Megan think of a random number from 1 to 100, which he then guesses correctly to demonstrate his ability to read minds. Megan is amazed that Cueball was correct, but he simply dismisses her disbelief and wants to go back to pretending to lead a normal life.

The four panels are actually a setup to the real joke in this comic: the final sentence spoken by a narrator. It reveals that Cueball has simply played a trick on Megan and that anyone can repeat it. The joke is that, theoretically, a person can guess a random number from 1 to 100 once in one hundred tries, or 1% of the time, according to the law of large numbers. By playing this trick enough times on enough friends, the trickster is statistically likely to get a number right eventually. Assuming the person whose number he guesses is not familiar with the trick, it will appear as if the trickster is actually psychic. Should this happen, the trickster can then play the joke out as he wants, hence the "it's totally worth it" at the end.

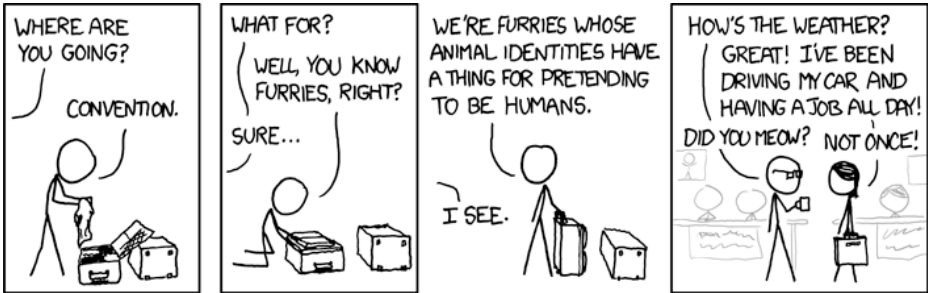
The title text appeals again to statistics. People are poor

random-number generators—e.g. being less likely to pick numbers at the extremes or exactly in the middle. Knowing this, the 'psychic' could restrict his guesses accordingly, improving his odds of guessing correctly.

Randall has made several smaller references to the number 42 as the answer to the ultimate question about the universe from Douglas Adams Hitchhikers Guide to the Galaxy (for instance in this message from 1608: Hoverboard, and the vision test in 1213: Combination Vision Test. This could be the reason he chose $42+1$ as his guess. He both knows Megan, and knows that she knows him. So thinking that he may suspect she would choose 42, she thus adds one, to not choose that exact number... Cueball took a similar reasoning based on his knowledge of Megan and himself, and was lucky this time. Maybe thus increasing his chance to more than 1% as from the title text.

#629: Skins

August 28, 2009



There's Livejournal drama between those who want to wear human suits over fursuits and those who just take off the fursuits.

Explanation

Furries, which have been discussed in a previous comic, are people who really like anthropomorphic animals and may enjoy drawing them or dressing up as them. One of the most prominent elements of the furry community is furry conventions, where furries meet-and-greet each other, show off and engage in activities in their fursuits, sell furry-related media, and so on.

Here, Cueball mentions furry identities. The grand majority of furries have a "fursona", that is, a furry animal with which they associate themselves. While there are different approaches towards creating a fursona, they tend to be an animal representation of either themselves or what they wish to be. These fursonas sometimes have quite a bit of background that explains their origins, their abilities, where they live, and their interests... even if their interests involve pretending to be humans. According to Cueball, "skins" are furries who have fursonas that like to pretend to be humans. In other words, skins are humans who pretend to be animals who pretend to be humans. The 4th panel magnifies the ridicule of the concept of skins, the skins at the convention behaving excitedly about events that actual humans usually consider mundane. This is further emphasized by the grammatically-correct but unnatural sounding phrases that they use (which could be similar to how humans imitating animal calls could sound). It is atypical to consider "having a job" to be an activity to emphasize doing in a day (it is more a description of a state of being

rather than an activity as such), and even stranger to say that in response to a question about the weather. This concept would be repeated in the title text of 1530: Keyboard Mash.

If this comic satirizes furry conventions, then the title text satirizes fursuits. In this case, there are skins who wear fursuits of their fursonas, but, since their fursonas like to pretend that they are humans, these skins wear human suits over their fursuits. Such a setup would seem unwieldy, so there are skins who avert this by simply taking off their fursuits, going to the conventions as their human selves, thus technically integrating into the whole "skin atmosphere". Possible problems from this can include the "wear a human suit" skins getting angry at the "take off the fursuit" skins for "ruining the fantasy atmosphere" (since, technically, the real-life skin is not the same that would be the fursona's human facade, especially if the skin makes no effort to change the appearance to fit the human facade), or again, because they are too "cheap" or "lazy" to make or otherwise obtain the two suits. This clash of ideals would cause a lot of drama, something that furies (or all other subcultures) are no stranger to.

The person off-screen seems to know something about furies (based upon their response of "Sure..."), and claim to understand this particular nuance of the scene (with a cursory "I see."), but may just be humoring Cueball and would have been happier not to have brought up the issue.

#630: Time Travel

August 31, 2009



WHILE IT'S TECHNICALLY TRUE,
I WISH SHE'D STOP PREFACING
EVERY SENTENCE WITH THAT.

She also starts every letter with "Dear Future <your name>".

Explanation

Megan prefaces her statements with "I've traveled here from the year 1983 [likely the year of her birth] to say this." The statement is (assuming 1983 to be her birth year or, at least, a year she lived during) perfectly valid, albeit not very meaningful as it is neither unique to her nor relevant to the succeeding question. As such, the preface breaks the Cooperative principle through the reasonable inference that the preface should be relevant, accurate and complete. While it is accurate (i.e. "technically true") and likely complete (Megan likely only having one birth date), it fails to meet the requirement for relevance and, as such, is misleading. Under the Co-operative Principle this could mean one of two things, dependant upon Megan's motivations and self-awareness, as she could be breaking the axiom intentionally (giving the statement a grander preface than she fully knows it to deserve) or alternatively breaking it unintentionally by truly believing that she is unique or special (or in some other way making it relevant) that she travels forward through time at one minute per minute. The latter is certainly possible within XKCD as we see in 1617: Time Capsule

Cueball notes this but still wishes that she would stop saying that as it is superfluous and captures more attention than her statement is actually worth. It would also get annoying to hear that same line repeated numerous times.

The title text continues this idea of Megan inserting another superfluous - although true - forwards to her letters. It's technically true because the letter will arrive at the recipient some time in the future, but this is not the way most salutations that begin "Dear Future <name>" are meant. Many schoolchildren are assigned to write letters to their future selves as an exercise in reflection and thinking about the future, but addressing every letter this way would likely become annoying.

#631: Anatomy Text

September 02, 2009

Plate 15: Female breast

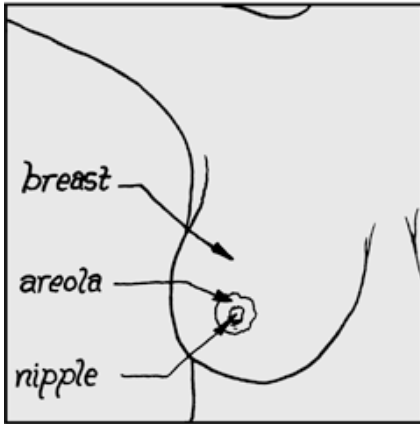


Plate 16: External female genitalia

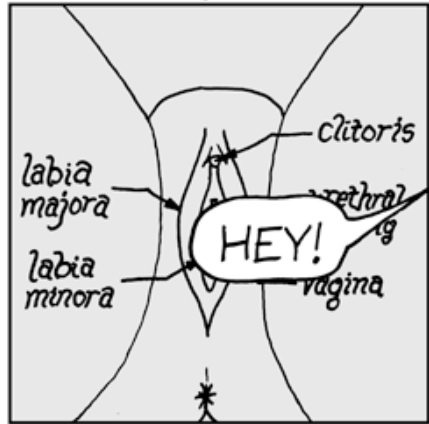


Plate 17: External male genitalia



Plate 18: Erect Penis



For many of the anatomy pictures on Wikipedia, I think this is actually not far from reality. They only look all formal and professional due to careful cropping.

Explanation

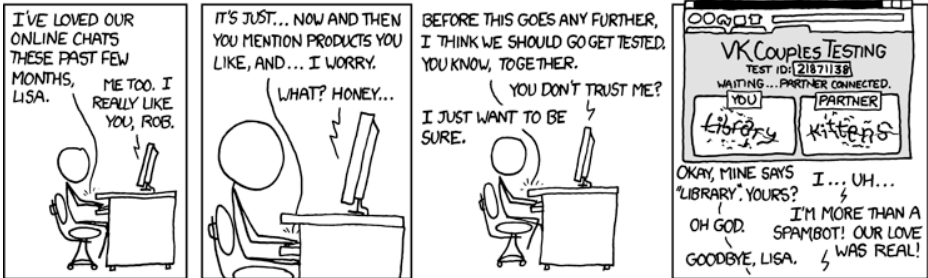
Megan and a person not shown are taking photos of their own anatomy for inclusion in relevant Wikipedia articles. This is one of the few comics where Megan is named, and also one of the few comics to feature speech bubbles. It is revealed that instead of taking these photos at home or in a professional studio, they are shooting at a TGI Friday's restaurant.

TGI Friday's is an American multinational restaurant chain known for its casual family-friendly atmosphere, upbeat service, and fried appetizers. Megan's and the person's behavior is of course highly inappropriate, due to the sanitation issues relating to sitting or laying naked on the tables, as well as public decency issues; nudity is illegal in most public places, and this is compounded by the fact that there are usually children in TGI Friday's.

The message implicit in the comic (and stated outright in the title text) is that careful cropping can produce useful, apparently professional reference images, even if the source photograph was not taken in a professional manner, or was pornographic in nature.

#632: Suspicion

September 04, 2009



Fine, walk away. I'm gonna go cry into a pint of Ben&Jerry's Brownie Batter(tm) ice cream [link], then take out my frustration on a variety of great flash games from PopCap Games(r) [link].

Explanation

Rob is having online chats with what appears at first glance to be a woman. However, he grows suspicious at the apparent consumerism dedication of the "woman" - and perhaps of the perfection of the online connection, touching on the stereotypical nerd fear that any relationship going well must contain some secret flaw - and so requests that they both "get tested". The woman on the other end of the computer does not pass a CAPTCHA test and is unable to prove she is a human.

In using the phrase "get tested", the comic is making a joke that refers both to the CAPTCHA test above and the STD or VD test that couples will take to make sure they are physically free of communicable diseases.

A spambot is an automated program (comparable in many ways to a robot) that sends out emails or links (such as in the title text) to simulate a human's writing but contains advertising. The test that Rob and "Lisa" take is called "VK", a reference to the Voight-Kampff empathy tests from the novel *Do Androids Dream of Electric Sheep* and the film *Blade Runner*. The test in these works is intended to distinguish real humans from very realistic humanoid robots called "replicants". Both CAPTCHAs and the Voight-Kampff test are related to the Turing test, a way to measure the degree to which a computer can successfully imitate a human.

The name "Lisa" may be an allusion to ELIZA, one of the

first chatbots, written in 1966. According to its (her?) creator, people became "quickly and deeply emotionally involved with the computer program" during the chat. "Lisa" may also reference the computer girlfriend Lisa from the 1985 movie *Weird Science*, or the Apple Lisa.

The title text is the spambot's last sad goodbye — it includes lots of product advertisements and links, such as an online advertiser may insert into a search results page.

329: Turing Test is another comic dealing with Turing tests/CAPTCHAs.

#633: Blockbuster Mining

September 07, 2009



The 2007 Bridge to Terebithia trailer put me off too much to see that particular movie, but I am cautiously optimistic about Where the Wild Things Are.

Explanation

Cueball has acquired the intellectual property rights to produce a movie, but is unsure of how to make it appealing to a wide audience. An off-screen character suggests hiring Michael Bay, a director and producer well known (and occasionally criticized) for his style of film adaptation. Cueball is unsure that the IP would be a good fit for a summer blockbuster, but is dismissed.

The following panels depict violent and gritty scenes from a spy thriller, starring an unknown and brutal female spy. In the last panel, she is revealed to be Harriet the Spy, the 11 year old protagonist of a bestselling children's book written by Louise Fitzhugh, as well as other spinoff books written by various other authors.

The comic references Hollywood's search for new stories to adapt to film, and how poor (not to mention violent) some of these adaptations can be. There is additional humor in the fact that the original novel is about school-child concerns such as friends and is not violent.

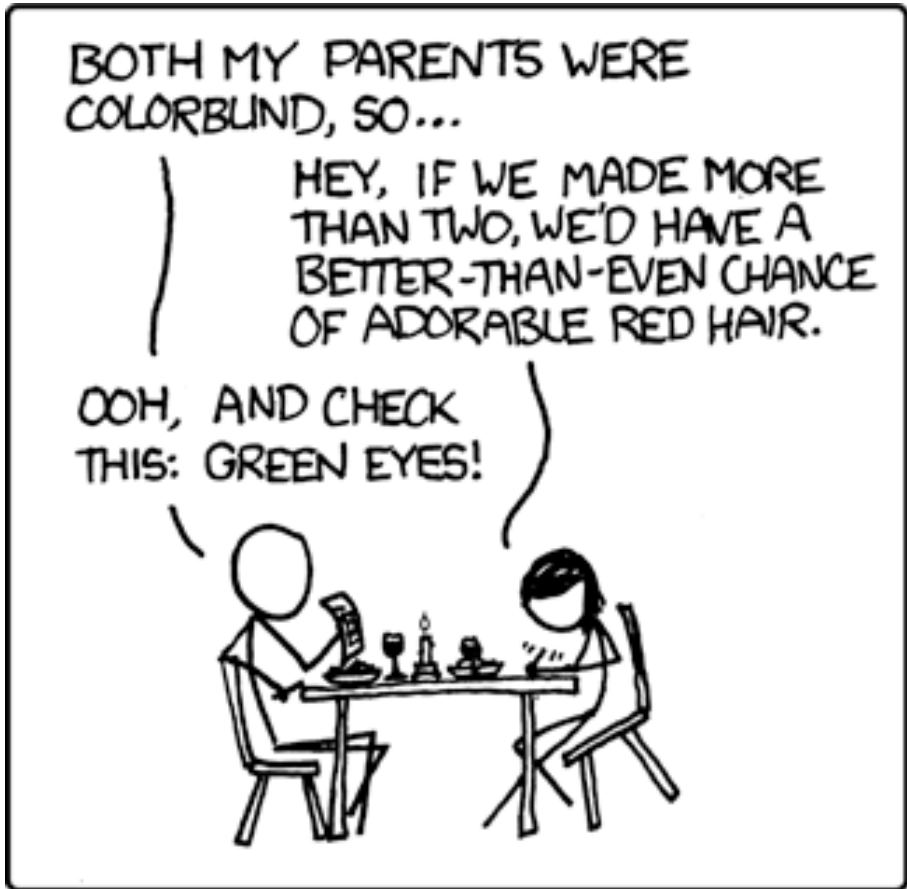
The film adaptation of *Bridge to Terabithia* had trailers that made it appear to have very little in common with the themes and tone of the novel. The actual movie is one of Hollywood's better book adaptations but the trailers were extremely misleading and off-putting to fans of the novel, as in the title text. Viewers who were unfamiliar with the novel and saw the movie with expectations based on the trailer were also unprepared

for the actual movie . The trailer was essentially every single special-effect shot from the movie, giving the impression it was a special-effects extravaganza, which would have been very inappropriate based on the novel, and does not reflect the actual content of the movie.

The film adaptation of *Where the Wild Things Are* was met with favorable responses from critics, the public, and the book's author.

#634: Date

September 09, 2009



TRIVIA: 30% OF BIOLOGIST FIRST DATES
DISINTEGRATE INTO MAKING PUNNETT SQUARES.

Well, the kid's definitely getting the biology geek
phenotype.

Explanation

Cueball and Megan (as biologists) are on a first date. As opposed to the usual romantic talk or discussion about each other's histories or character, the comic suggests that 30% of the time, two biologists on a first date will end up making Punnett squares, which non-biologists might not consider very interesting or romantic. The comic may be a play on the idea that couples on a first date might wonder about (or on a very promising date, even discuss) the traits in the other person that might be passed on to potential children.

A Punnett square is a simple diagram used in biology to determine the probable resulting genotype of cross-breeding two organisms, be they plant or animal (including humans). The diagram shows all possible results of crossing a single genotype from each parent in the offspring genotype following Mendelian inheritance.

For humans and most animals, there are two alleles for each gene, and each parent passes one of their alleles for each gene on to the offspring. The most simple Punnett square is a 2x2 table with a legend of the two paternal alleles on one axis (e.g.: A and A) and the two maternal alleles on the other axis (e.g.: A and a). Each box of the Punnett square represents a possible genetic outcome as a result of each each of the alleles being passed on to the offspring (AA, Aa, AA and Aa). For certain genetic traits, one genotype may determine a specific trait in the offspring; e.g. black hair in rats. Certain genotypes have

dominant and recessive alleles. An offspring must have both of the recessive alleles to display the recessive trait; in the above example, if "a" was an allele for a recessive trait, the offspring could not have the recessive trait, as there is no possible aa outcome. This is the basic principles that allows statements to be made that two parents with a certain blood type or eye color could not possibly have an offspring with a certain other blood type or eye color.

More complicated Punnett squares can factor in multiple genes and be larger in scale, but ultimately follow the same principle. The premise for the purposes of the comic is that by using Punnett squares, one can assess the likelihood of certain genetic traits (such as hair color or color blindness) in their offspring with another person. One would have to know their genetic makeup in general for this to be possible.

While a genotype refers to the genetic makeup of an organism, a phenotype as referenced in the title text refers to the resulting traits (e.g.: Red hair is a phenotype).

The traits mentioned by Cueball and Megan are all genetic traits which can be traced using Punnett squares. That said, at least two of the traits (green eyes and color blindness) are not traits determined by a simple single-gene interaction. Color blindness can be inherited, although there are a significant number of genes that can factor into various types of color blindness. Red green color blindness, the most common variety, is sex linked

to the X chromosome. Because of the way X chromosomes are passed, if Cueball's mother was colorblind then Cueball would be, though his faulty X chromosome could only be passed to a daughter who would need another faulty X from her mother to inherit colorblindness. Once thought to have fairly simple genetic factors, eye color is now known to be a factor of at least 15 different genes with almost any parent-child combination possible. Red hair is still believed to be a recessive trait associated with a small number of genes (perhaps even one gene), although other traits once thought to be determined by only one gene have since been proven otherwise.

The title text mentions how a child with Megan and Cueball as their parents would almost certainly grow up to share the same interest in biology as both of their parents. Although a child would share certain traits with their parents, either ones that are genetic or ones picked up in their respective childhoods spent with their parents, the claim made in the title text is not guaranteed to become true as a child would most likely differ from their parents in some way or another, due to factors such as different life experiences and a different background that the child grew up in compared to their parents.

#635: Locke and Demosthenes

September 10, 2009



Dear Peter Wiggin: This letter is to inform you that you have received enough upvotes on your reddit comments to become president of the world. Please be at the UN tomorrow at 8:00 sharp.

Explanation

Ender's Game was published in 1985, when most people had never used (and some had never heard of) the internet. The first webpage set up with individual personal opinions (leaving out forums and bulletin board services) was online in 1994, the word "weblog" was invented in 1997 and "blog" in 1999. When Orson Scott Card wrote Ender's Game, Peter and Valentine's plan was based on a sci-fi idea expected to occur in the near future.

However, this apparently science-fictional future concept is now just the mundane (and extremely un-influential) act of blogging. In 1985, Orson Scott Card's idea of how politics works in practice may have seemed a little naive, but now that blogging is an everyday phenomenon, Peter and Valentine's aspirations seem downright silly. We see their plan to win vast political influence manifest itself as a WordPress blog, and a particularly unimportant one at that, with 0 comments on most posts.

The joke hinges on the underwhelming reversal of Peter and Valentine's expectations. It forms both a parody of science fiction that has been rendered outdated by technology, and also a parody of the expectations well-intentioned people have going onto the internet to express their opinions.

The titles of Peter's blog posts parody the arrogance of

internet commentators, with names beginning with things like "Everyone's wrong about..." This further underscores the lack of influence his WordPress blog would have and his naivete, as this is a typically unconvincing way to speak to people about politics, but someone with the arrogance to think everyone will naturally see their genius and insist they are put in charge of the world would not realise it.

In the bottom right corner, there are links to other blogs. One is for Demosthenes, but the other is for FiveThirtyEight, a political blog founded by Nate Silver in 2008, more than a year before this comic was released. It was still owned by Nate in 2009, the year of this comic's release, but in 2010 the blog became a licensed feature of The New York Times online and in July 2013, ESPN announced that it would become the owner. The blog takes its name from the number of electors in the United States electoral college: 538. It is a website that focuses on opinion poll analysis, politics, economics, and sports blogging. Nate Silver has been referenced, several times in xkcd, though mainly in the title text, before this comic for instance in 500: Election.

The title text uses Locke's full name, Peter Wiggin, and is formed as a short letter that informs him that he has become the president of the world, and that he should meet tomorrow 8:00 sharp at the United Nations (UN) headquarters. This is either a very child-like representation of how a presidential appointment might be announced or a sarcastic comment someone has left on his blog — either way, further riffing on the naivete of

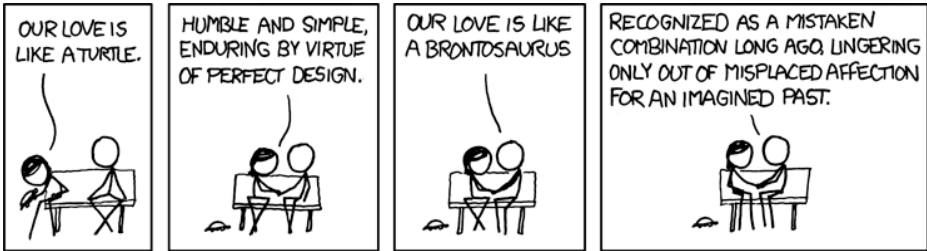
the plan in the first place. Also note that the note is addressed to "Peter" rather than "Locke"; Peter's attempt to remain anonymous has failed miserably.

During their conversation, Peter is shown feeding a squirrel. In *Ender's Game* the character of Peter Wiggin is a sadistic sociopath - and there is a particular scene in the book where Valentine stumbles across a squirrel skinned by Peter still twitching in pain.

xkcd has referenced *Ender's Game* before this, specifically in 241: Battle Room, dealing with Ender's experience during his training, and 304: Nighttime Stories, dealing with the sequels to *Ender's Game*.

#636: Brontosaurus

September 14, 2009



Well, sex is like a velociraptor: despite your movie-fueled lifelong neurotic obsession, unlikely to be found in your house.

Explanation

Megan describes her relationship to Cueball with the simile "our love is like a turtle," a comparison often made when referring to a shy and slowly developing yet steady sort of romance. However, Cueball thinks that the Brontosaurus is a better comparison. His explanation refers to the fact that remains of a certain apatosaurine were initially named *Brontosaurus excelsus* by the paleontologist O.C. Marsh in 1879. This species was later determined in 1903 to be in the same genus as *Apatosaurus ajax*, which Marsh had named two years before *B. excelsus*: the older genus name is preferred according to convention (making the preferred binomial *Apatosaurus excelsus*). The term *Brontosaurus* therefore became a scientific redundancy (a so-called junior synonym), and had this status at the time of this comic's release. Due to the correct skull for an apatosaurine not being confirmed until 1978, the term "brontosaurus" had in the meantime become popularly associated with an apatosaurine depicted with a speculative *Camarasaurus*-like head, hence the "mistaken combination" mentioned in the comic.

Applied to the scenario in the comic, Cueball apparently considers the relationship without any emotional foundation and only continues it out of nostalgic motives. This conclusion counteracts the initial romantic tone adopted by the turtle simile, as comparing a romance with a falsely classified fossil is one of the least charming statements imaginable.[citation needed]

The title text aims at Randall's well-known enthusiasm for Velociraptors. Megan retorts by comparing any future sex between the two of them to be as likely as finding a Velociraptor in his house. This is a common trope in modern relationships where the assumption is that it is the man who wants sex, and the woman will withhold it as a form of punishment, usually in response to her emotional needs (which, stereotypically, takes the same importance to the woman as sex does for the man) being denied by the man (in this case, she initiated a romantic conversation, hoping for him to reciprocate, and yet he took the opportunity to do the opposite). The insult has a second barb: painting Cueball as being obsessed with movies involving Velociraptors. It may also hint at his having a collection of pornography, but not necessarily anything that caters to both obsessions at once.

Randall has previously mentioned the Brontosaurus name change in 460: Paleontology. The Apatosaurus also appears in 15: Just Alerting You and 650: Nowhere.

Updates[edit]

However the status of "Brontosaurus" remains under discussion, with a 2015 study of diplodocids reporting that the more gracile fossils should be classified in a separate genus. This would re-divide the apatosaurines between the Brontosaurus and Apatosaurus genera.

#637: Scribblenauts

September 16, 2009



Let me look away and type 'guy who's just jealous that I beat all his MarioKart times' and turn back, and ... yup, there you are again!

Explanation

Scribblenauts is a game for the Nintendo DS in which the player controls a character named Maxwell, whose goal is to get a "Starite" in each level. The player has the ability to summon over 22,000 different objects into the game by typing them on the touchscreen using the DS's stylus device. Those items are then ostensibly used to help Maxwell collect the Starite (for example, typing "ladder" to help him reach a Starite that's inside a tree), but the player can decide to forgo the objective and just type in random things for fun.

The Large Hadron Collider is the world's largest and highest-energy particle accelerator, and has excited the imagination of writers and journalists in popular culture, some of whom posit the theory that a catastrophic accident at the LHC could destroy the world. One of those ideas concerned the LHC creating a black hole that would proceed to suck in all the surrounding matter. However, in the game, the LHC, when tapped, creates a comically small black hole which only kills Maxwell.

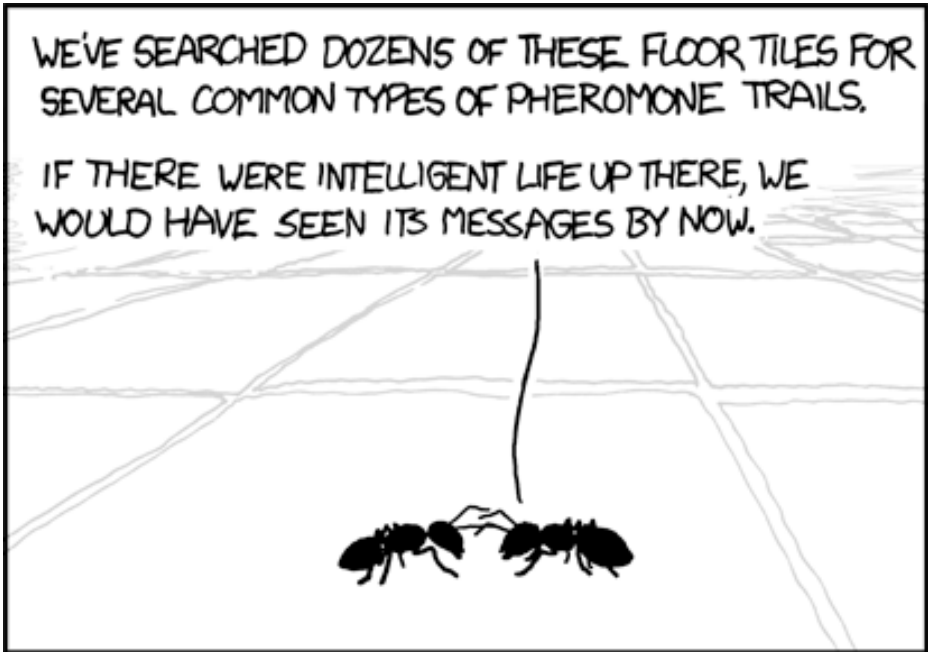
Megan discovers that the LHC can be summoned in Scribblenauts, and has a fun time creating black holes with it. Cueball's snide comment is an unfortunately rather common reaction among adults towards entertainment geared for children, and the fact that Scribblenauts is a portable game just gives him another stick to beat it with. Irritated, Megan types in the phrase "pretentious asshole", and then pretends that Cueball has

suddenly appeared. It is unclear whether she is referring to Cueball spawning in-game, or his presence in the real world. Note that, in reality, Scribblenauts doesn't respond to profanity.

In the title text, she types "guy who's just jealous that I beat all his Mario Kart times" (this could be a reference to 423: Finish Line and 290: Fucking Blue Shells) and once again, Cueball "appears" right in front of her. Mario Kart is another video-game series geared towards children, and there's a version of it for the DS, which implies that Cueball's just being snooty about Scribblenauts because Megan has so thoroughly dominated him in another "DS kids game".

#638: The Search

September 18, 2009



THE WORLD'S FIRST ANT COLONY TO ACHIEVE SENTIENCE CALLS OFF THE SEARCH FOR US.

I am so excited about the Kepler mission. This is the second most important thing our species has ever done, right behind inventing the concept of delivery pizza.

Explanation

This comic is a commentary on the search for extraterrestrial intelligence. The ants' dialogue describes the narrow scope of their search (a few tiles, and only looking for pheromone trails), and thus they conclude that there is no other intelligent life. The irony is that humanity does of course exist,[citation needed] but were simply not present in the kitchen at the time of search, nor do we communicate with ant pheromones.[citation needed]

Similarly, our ability to search outer space for other life is limited to our ability to detect specific modes of communication (i.e. radio waves) and to the very limited area of space imposed by technological limitations on transportation, range, and sensitivity of our equipment.

The title text refers to the Kepler mission to discover Extrasolar planets. In August 2009, a couple of weeks before this comic, the first results of this mission were released, which showed the spacecraft to be healthy and had detected a known exoplanet. No new science results would be released until November of 2009, which Randall was anticipating. This mission has found more than 2,700 planet candidates that still have to be confirmed by other telescopes. So that's the difference to the ants. As of August 2013, two "reaction wheels" (heavy metallic discs that can be spun to impart angular momentum to the probe, mounted on the major axis; an alternative to reaction thrusters, which require a

depletable supply of reaction fuel) on Kepler have failed, causing NASA to change the mission, though it will still be looking for planets with its two remaining wheels.

The second part is a bait-and-switch joke; by calling the search for extrasolar planets "the second most important thing our species has ever done", it creates the expectation that the "first most important thing" will be a monumental breakthrough, such as for example the concept of language. Instead, the title text ends up just revealing that Randall likes having pizza delivered.

#639: Lincoln-Douglas

September 21, 2009



AFTER HIS 1860 LOSS TO LINCOLN, STEPHEN DOUGLAS'S FAMED DEBATING SKILLS ENTERED A RAPID DECLINE.

Stephen Douglas actually died soon after the debates and election, but if you demand historical accuracy in your webcomics you should be reading **Hark! A Vagrant**.

Explanation

The Lincoln-Douglas debates of 1858 were a series of seven debates between Abraham Lincoln and Stephen Douglas, respectively the Republican and Democratic nominees for a U.S. Senate seat in Illinois (Douglas was the incumbent). All seven debates were devoted to the topic of slavery, a red-hot issue in the United States that played a significant role in precipitating American Civil War. Although Lincoln ultimately lost the election, he had the edited text of the debates published in a book. The book's popularity and widespread media coverage of the original debates helped put his name on the map in American politics, leading to his nomination for President of the United States by the Republican party in 1860. Lincoln went on to win the election (Douglas was one of his opponents in this race), after which point several states immediately seceded and formed a separate government, the Confederate States of America. The Confederacy attacked Fort Sumter in April 1861, sparking the American Civil War, a vicious conflict between the states that would last for four years.

In 1863, the Union Army of the Potomac defeated the Confederate Army of Northern Virginia at the Battle of Gettysburg in Gettysburg, Pennsylvania. Four and a half months later, President Lincoln delivered the Gettysburg Address, to dedicate the Soldiers' National Cemetery. The Address, less than three minutes long, became one of the most famous speeches in American history; millions of schoolchildren have memorized it verbatim in the 150

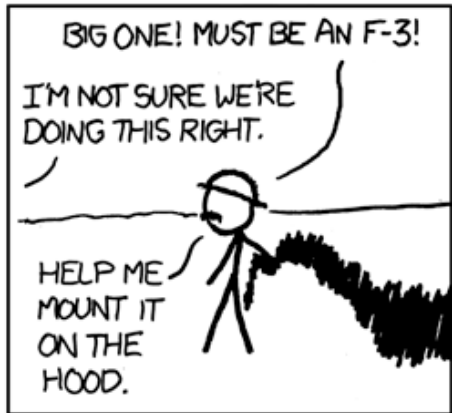
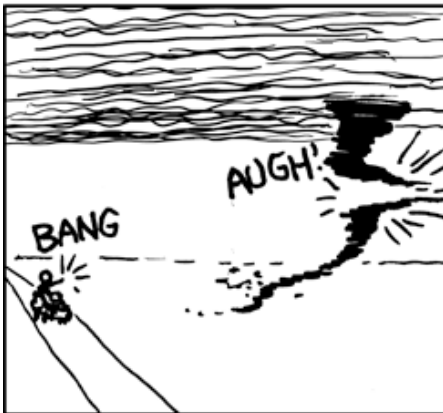
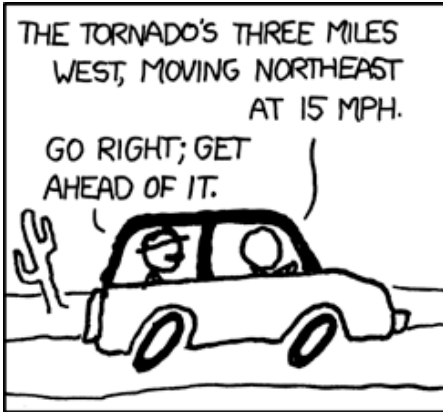
years since.

In this comic, Stephen Douglas heckles President Lincoln after the opening sentence of the Gettysburg Address with a juvenile "your mom" joke, which is both anachronistic and not up to Douglas's usual elegant standards of debate. The only difference from the original speech is that "our fathers" is replaced with "your mom".

The title text admits that Douglas actually died soon after the election (passing away in June 1861), but suggests the webcomic *Hark! A Vagrant*, written by Kate Beaton, if you're looking for historical accuracy in your webcomics. *Hark!*'s usual topics are historical or literary figures.

#640: Tornado Hunter

September 23, 2009



The Fujita Scale was replaced by the Enhanced Fujita Scale in 2007, but I think 'EF-5' sounds stupid, so I vote we just use the new measurements for assigning numbers but still call them 'F-whatever'.

Explanation

This is a play on the occupations/hobbies "tornado chaser" - someone who, instead of evacuating the area like normal people, actually goes in to get a closer look at the tornado - and "big game hunter", who often kill for trophies. Tornado chasers are typically, but not always, meteorologists. Here, the tornado chaser actually hunts the tornado with a gun like big game, the joke being that this is not possible in real life.[citation needed]

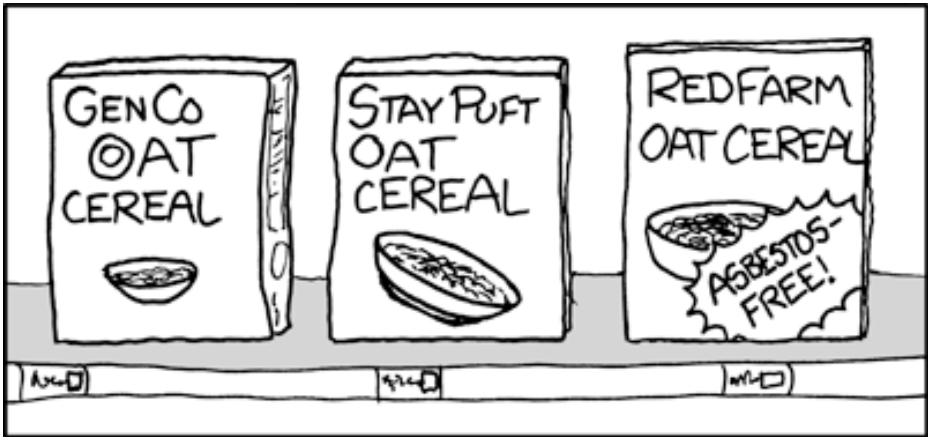
The "F-3" is a reference to the Fujita scale used to classify tornado intensity. It goes from 1 to 5, with 5 being the highest, with an updated Enhanced Fujita scale, as mentioned in the title text, being used in the US since 2007.

The title text is an aside from Randall, saying that he finds the notation for the Enhanced Fujita scale (EF-#, for example EF-5 for a level 5 tornado) to be stupid, and suggests that we continue to use the Enhanced Fujita scale to measure the strength of tornadoes, but abbreviate it to F instead, leading to the non-stupid "F-whatever" notation, 'whatever' signifying the number of the tornado on the scale.

This is the second comic about tornadoes, a recurring subject on xkcd, but it was the first to actually show a tornado. Storm chasers hunting tornadoes was also mentioned in the first comic about tornadoes 402: 1,000 Miles North and they were also shown in 752: Phobia.

#641: Free

September 25, 2009



I HATE WHATEVER MARKETER FIRST
REALIZED YOU COULD DO THIS.

Asbestos is bad; definitely get the one on the right. Wait --
this one over here has no swine flu! Now I can't decide.

Explanation

Asbestos is a fibrous material most commonly known and used for its heat-resistant properties. It was commonly used in housing insulation until its astonishingly destructive effects on human lungs were discovered. The use of asbestos in housing is now banned, but asbestos is still quite common in laboratory hot pads, as well as in concrete industrial buildings where the risk of it getting into the air is minimal.

The comic depicts a common advertising trick taken to an absurd extreme; asbestos would not be encountered nor added to cereal and thus it is considered obvious that all cereal is free from asbestos. However, here one brand of cereal is advertising this fact, implying that it is not the norm and the other cereals contain asbestos. Note that in some countries, like Germany for example, this practice is actually not allowed, since it counts as "misleading advertising".

While the suggestive implication might be that competitive products do not declare as asbestos free because they cannot truthfully say this, the irony may be that the "asbestos-free" disclaimer could also cause a customer to distrust the product on the grounds of damning by faint praise—if the best thing they can say about a product is that it doesn't contain a toxic building material, do we really want to know what actually is in this stuff?

The claim in the title text—that a rival product has no swine flu—is equally superfluous, as any food product containing disease-causing viruses would be subject to recalls, severe fines, and quite a few people losing their jobs; the fact that the product is actually on a supermarket shelf implies that it already has a stellar reputation for not causing serious illness.[citation needed] The use of it here could also be a reference to 574: Swine Flu.

The competing claims, however, sets up the hopefully false risks involved in whether to choose the one with definitely no asbestos (but possibly contains swine flu) or the other that definitely has no swine flu (but may include asbestos).

- GenCo probably stands for Generic or General Company and may be a reference to General Mills
- Stay Puft is also the company that produces marshmallows in the movie franchise Ghostbusters.
- Redfarm is likely referring to cereal companies that advertise their "farm freshness", maybe a reference to Pepperidge Farm. It is also a Chinese Restaurant in NYC, although this is most likely a coincidence.

Misleading advertising is also the subject of the previous comic 624: Branding, and of subsequent comics 870: Advertising and 993: Brand Identity.

#642: Creepy

September 28, 2009



And I even got out my adorable new netbook!

Explanation

This comic displays Cueball's fears that his attempts to strike up a conversation with Megan will only result in her rejecting him and even humiliating him in front of others for attempting to get to know her - he might even risk getting his picture on Facebook with a warning that he is a creep to be avoided. This is because he worries that others might interpret his behavior as sexual harassment, the exaggerated flip-side of his attempted courtship. It turns out in the fifth and last panel that the first four panels was just one large thought bubble on how Cueball worried an attempt to contact Megan would turn out.

Ironically, however, Megan is actually attracted to Cueball and is dismayed that he has not spoken to her. Therefore, Cueball's fears are unfounded and are even preventing the two from meeting and possibly forming a relationship. Megan could of course also have spoken to Cueball herself, but she expects him to make a move if he is interested. Thus she also prevents herself from making contact because of her own expectations and fears of rejection.

The title text is the continuation of Megan's apparent journal entry and further emphasizes the irony of the situation: in the attempt to be alluring to Cueball, Megan took out her "adorable new netbook," the very thing Cueball stopped himself from complimenting in the first place.

This comic comments on the unsettling effects of social change, particularly with respect to the advent of social media and to modern sensitivity toward a woman's (or any person's) right to be left alone in public. It points out that attempting to start a conversation with a stranger has become risky, and we have yet to evolve new customs and conventions to signal openness to such an approach. The risk is aggravated by social media, by which means an innocent misjudgment may subject one to public humiliation - or even worse someone might expect that you had intention of performing some sexual crime - if that type of info is published with a picture and/or your name on Facebook or Twitter etc. your life could be ruined without any reason. As a result, opportunities to meet other people are missed, loneliness and social isolation are increased, and one may even experience existential fears of being unattractive. Ironically, some people react to this problem by relying on the same social media to stay connected with others.

This comic also might imply that "love at first sight" isn't what it seems to be.

#643: Ohm

September 30, 2009

REMEMBER: WITH GREAT
POWER COMES GREAT
CURRENT SQUARED
TIMES RESISTANCE.



OHM NEVER FORGOT HIS
DYING UNCLE'S ADVICE.

More generally, with great power comes great $d\text{Energy}/dt$.

Explanation

This comic deliberately conflates the origin story of the comic-book superhero Spider-Man with the origin of Ohm's law, as both the origin story of Spider-Man and Ohm's law deal with power, though the power is of different types.

In the origin story of Spider-Man Peter Parker (who would become Spider-Man) is raised by his Aunt May and Uncle Ben. When Parker goes through various stages of teenage angst and rebellion, his Uncle Ben (in different situations depending on the comics and/or movie) advises him that "with great power comes great responsibility". Here, power is taken by the reader to refer to Parker's superhero powers, acquired from a bite from a radioactive spider and via various technologies Parker designs himself. It is to be noted, however, that Uncle Ben doesn't know about these powers in the origin stories and only means this as general advice.

In contrast, in this xkcd comic, Ohm's law is supposedly delivered to Georg Ohm by a similar authority figure in the form of relating current and resistance to power (in the unit of Watts), where power is defined as the change in energy per unit time. In real life, Ohm obviously was never "advised" about the law but instead determined experimentally that current through an Ohmic resistor was proportional to the voltage.

This relationship is summarized by Ohm's law:

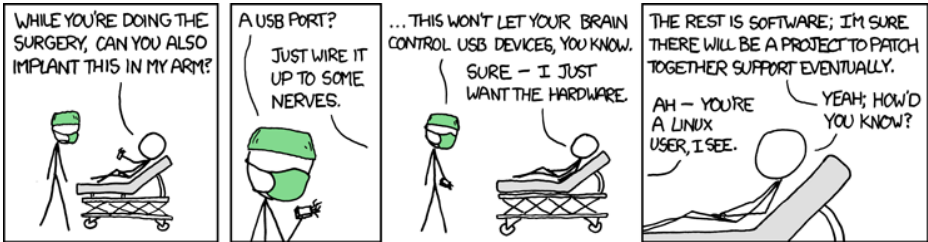
Electric power is defined as:

The joke here is that given the proportionality, by definition a great (amount of) power would involve a great (amount of) current and/or resistance (squared), as here the phrase 'great power' could be taken to mean 'a large capability to do things' or 'a numerically large quantity of (electrical) power'. There is also humor in the improbability of this scenario, the comparison with Spider-Man, as well as the suggestion that it was how Ohm derived his eponymous law.

The title text takes this further, by redefining the power equation as a more generalized differential equation, which simply states that power is proportional to the change of energy per unit time (dE/dt), which is another way of stating that "power = energy per unit time". In many engineering and physics books the differential form is presented as the general form from which a specific algebraic form can be derived as the differential form is more adaptable to special cases, and therefore more general, and so the title text extends the conflation of physical power and electrical power to a more generalized form.

#644: Surgery

October 02, 2009



Damn. Not only did he not install it, he sutured a 'Vista-Ready' sticker onto my arm.

Explanation

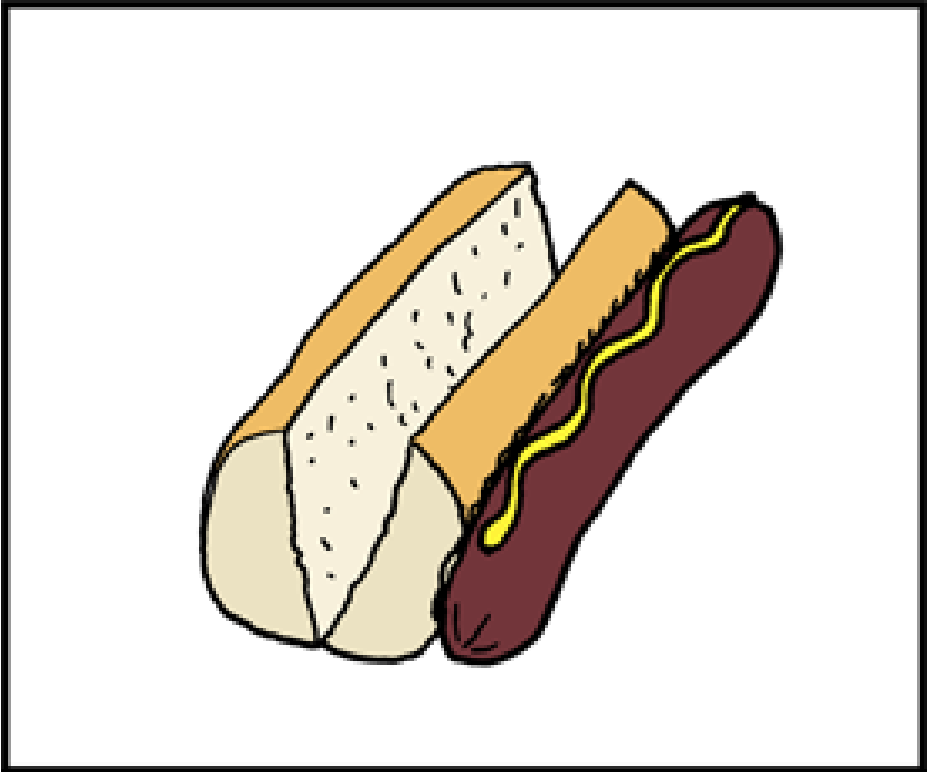
Cueball is lying down, waiting to undergo surgery, when he asks the surgeon to insert and wire up a USB port to nerves. The surgeon assumes that Cueball wants to control USB devices, but Cueball assures him that he just wants the hardware. It is revealed that he is waiting for the software update that will allow him to do as he pleases. However the human nervous system doesn't conform to USB standards.[citation needed]

Linux is an open source kernel for an operating system. Linux is notorious for its less-than-perfect support for hardware, although support for most hardware is eventually patched into the official kernel release. Cueball is here under the impression that support for a USB port can be patched into his arm in a similar fashion to how hardware support can be added to the Linux kernel.

The "Vista-Ready" sticker in the title text is a humorous indication from the doctor that the patient is "advanced enough" to have Windows Vista installed. The irony is multilayered. There was a lawsuit against Microsoft about promoting not-so-capable computers as "Windows Vista Capable"; they could neither run Vista fully nor smoothly. On top of that, the typical Linux user would not be very enthusiastic about Windows at all; someone who runs Linux has actively chosen an alternative operating system.

#645: RPS

October 05, 2009



REVERSE POLISH SAUSAGE

It looks good, but it needs more postfixins.

Explanation

Reverse Polish notation is a method of writing mathematical expressions, where operators are after their operands, not between.

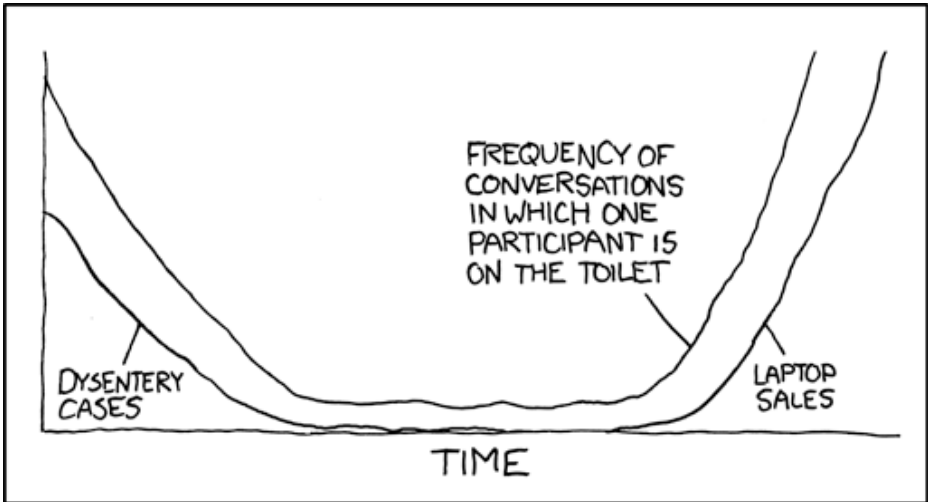
For example, $2 + 2$ becomes $2\ 2\ +$, and $(2 \times 2) \div 3$ becomes $2\ 2\ *\ 3\ /\$. This comic plays on that, by placing a Polish Sausage (a North American term for Kielbasa) after both halves of the bun instead of between.

The title text is a pun on the fact that Reverse Polish Notation is also known as Postfix notation. "Fixins" is a Southern US slang for condiments such as mustard, chopped onions, and more. The slang is derived from how you "fix" up, or prepare, your food item whenever you have items that can be customized per person after being cooked.

The news section for this comic says "Comic today's you confuses here click if", which is also written in some kind of reverse polish notation and would be "If today's comic confuses you, click here" in proper English.

#646: Conversations

October 07, 2009



If the dysentery graph looks historically inaccurate it's because I got all my data from Oregon Trail.

Explanation

This comic humorously links both dysentery and laptop computers with conversations in which one participant is on the toilet.

Dysentery results from viral, bacterial, or parasitic infections in the intestine, and is characterized by severe diarrhea, which means that someone will be on the toilet frequently and/or for a long time. So when dysentery was more prevalent, people spent more time on the toilet and presumably would have to talk to other people while sitting there. Dysentery has largely subsided in the developed world, which is why the graph of dysentery cases falls to near zero over time.

Laptops could cause toilet conversations because wireless internet allows people to carry their laptop anywhere around the house, even to the bathroom. They can still communicate with friends by text, voice, or even video chat, which means people can multitask by holding an online conversation while sitting on the toilet. If the chatting is just in text, then the other person won't have to know that their friend is on the toilet - Hopefully voice and video chat are less common while sitting on the toilet.

There are always some conversations on the toilet, because the social conventions against it are sometimes ignored or overridden by urgent situations. This explains why the conversations graph does not reach zero in the

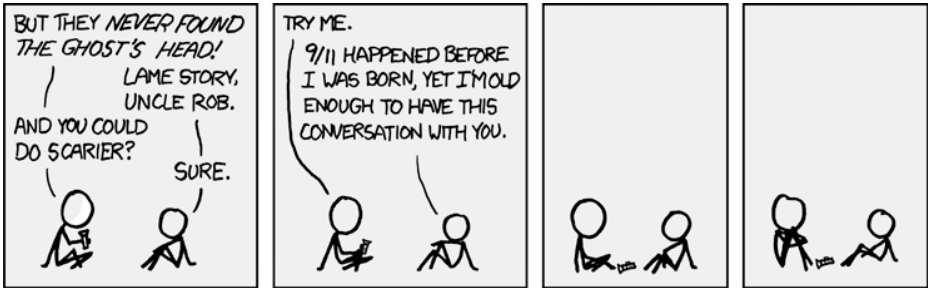
middle.

The joke in the title text is a direct reference to a previous comic regarding The Oregon Trail and dysentery.

The title text refers to the popular educational computer game around the 1980s titled the Oregon Trail. The game purports to educate students about 19th-century pioneer life on the Oregon Trail in the western United States. Among the features in the game is the common occurrence for a party member to die of a disease such as cholera, typhoid, or dysentery. The title text humorously suggests that the data for the graph comes from occurrences of dysentery in the game.

#647: Scary

October 09, 2009



I'm teaching every 8-year-old relative to say this, and every 14-year-old to do the same thing with Toy Story. Also, Pokemon hit the US over a decade ago and kids born after Aladdin came out will turn 18 next year.

Explanation

Rob is telling his eight-year-old nephew a ghost story, employing such clichéd devices as a flashlight-lit face and stock ghost story endings. The boy is unimpressed, so Rob challenges him to come up with a scarier story. Rob's nephew merely states that he was born after 9/11, and yet he is already mentally developed enough to hold a conversation with an adult. This proves effective, as in the final panel Rob assumes a fetal position, gripped by existential dread.

There is no hidden meaning here, but this comic sure is scary for many adults. What's being implied here is that time seems to be moving really quickly and we're getting older faster than we think. Events that seem like they "just happened" have happened long enough ago for a whole other person to come into existence, grow up, and learn to carry on a conversation. Every time we get reminded of this fact, it can be scary, as you then realize that you are now closer to your death...

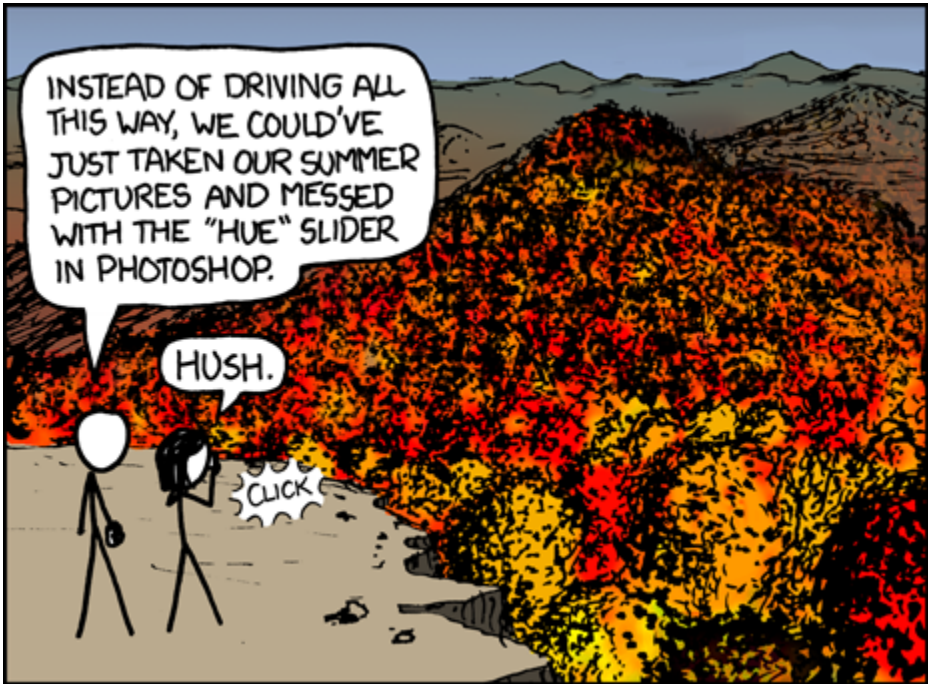
9/11 was a terrorist attack in the United States in 2001, on September 11th. Major events such as the assassination of Kennedy, the Moon Landing of Apollo 11 or 9/11 are easily memorable. It is often said that "everyone remembers where they were when they first heard...". In consequence, these events act as milestones in our memory. They are recalled more vividly, and seem more recent. Today this is maybe also topping the Attack on Pearl Harbor which happened in 1941.

The title text mentions that Randall is teaching his 8-year-old relatives to say the same as in the comic — presumably to the annoyance of his older relatives who will be reminded of the fast passage of time. He does not stop here, but teaches the 14-year-olds to say they are born after Toy Story — a major block buster hit from Pixar which came out in 1995. A movie many people will remember fondly and feel just came out the other day. He continues with these scary thoughts by mentioning that Pokémon (1996) came out over a decade ago and that kids born after the big Disney hit movie Aladdin from 1992 will turn 18 next year (i.e. in 2010 a year after this comic was published).

Randall has both before and after this comic tried to make people feel old several times.

#648: Fall Foliage

October 12, 2009



And I could replace you with older pictures of you, from back when you looked happy.

Explanation

Cueball and Megan have driven some distance from home, and Megan enjoys the pastime of leaf peeping, happily taking photographs of the beautiful fall or autumn foliage. Cueball points out that they could've stayed home and used Photoshop to alter pictures they've already taken, saving themselves the trouble of going on the trip. The hue control in such image editing programs shifts the colors around the spectrum without altering the brightness; the green leaves in a summer picture could then easily be shifted to yellow or red.

Megan simply shushes him in the strip, but the title text is implied to be Megan's retort, saying that Cueball used to be a happier person, and if he will continue being like this, she would prefer to see him in old pictures rather than living with him. Or it could be that Cueball is making a response to the shush as he seems to be the more technologically inclined and more annoyed.

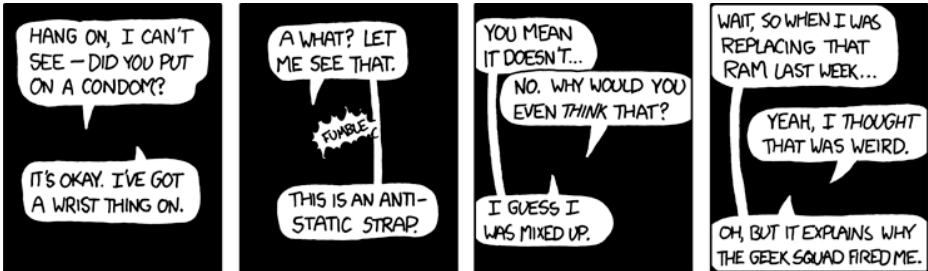
The comic is also showing how, because of technology, many people are not as "happy" as they once were. Instead of appreciating natural beauty, Cueball simply wishes to "replicate" the experience by using Photoshop; unfortunately, this would deprive him of both the experience of beautiful fall leaves and a shared intimacy with Megan.

See also 1314: Photos about people taking pictures and White Hat complaining.

Later in 1719: Superzoom White Hat and Cueball again discusses photography, while in 2111: Opportunity Rover White Hat shares his anti-photography opinion again.

#649: Static

October 14, 2009



I firmly believe that nothing can go wrong on a project if you're wearing one of those wrist things.

Explanation

Antistatic wrist straps are important safety tools for electronics work such as handling computer parts. The wrist strap provides a conduction path directly from one's skin to an electrical ground, preventing the buildup of static electricity which, if accidentally discharged upon touching part of a circuit, can damage sensitive electronic components.

Condoms, on the other hand, are an important safety tool for sex, as birth control and protection from STIs.

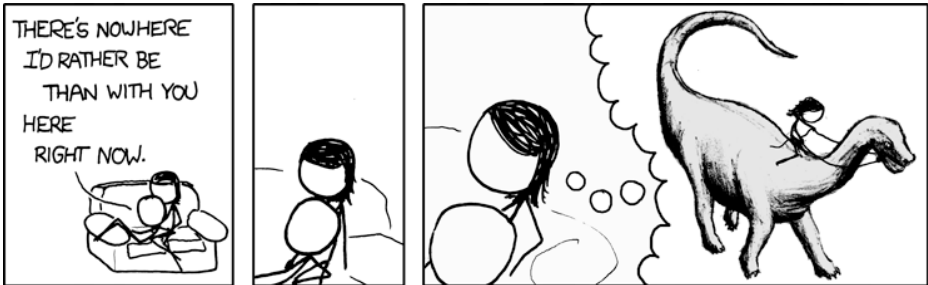
The last panel implies that in his confusion, Cueball put on a condom in order to replace the RAM in his computer the previous week. Geek Squad is the computer service department of the Best Buy chain of American electronics superstores. So Cueball implies that he put on a condom while working in Best Buy, for performing computer repair, and was fired for indecency.

The title text conveys the irrational[citation needed] belief that nothing can go wrong on a project while wearing an antistatic wrist band. In reality, the wrist band will only protect your electronics from electrostatic discharge, and there are plenty of other things that could go wrong on an electronics project, such as bad soldering, installing the wrong component, mechanical damage through excessive force (e.g. blunt force trauma) or even electric shock from an exposed live voltage. Or the text

could be referring to even non-electronics projects, in which case the wrist band would really be pointless.

#650: Nowhere

October 16, 2009



I mean, seriously, **NOWHERE**? For starters, there are like a thousand species of dinosaur.

Explanation

This is a sarcastic comic poking fun at romanticism.

The phrase used by Cueball in the first panel hints at the romantic, suggesting that he is so happy to be with Megan that there is nowhere else that he would rather be right at this moment than here with her.

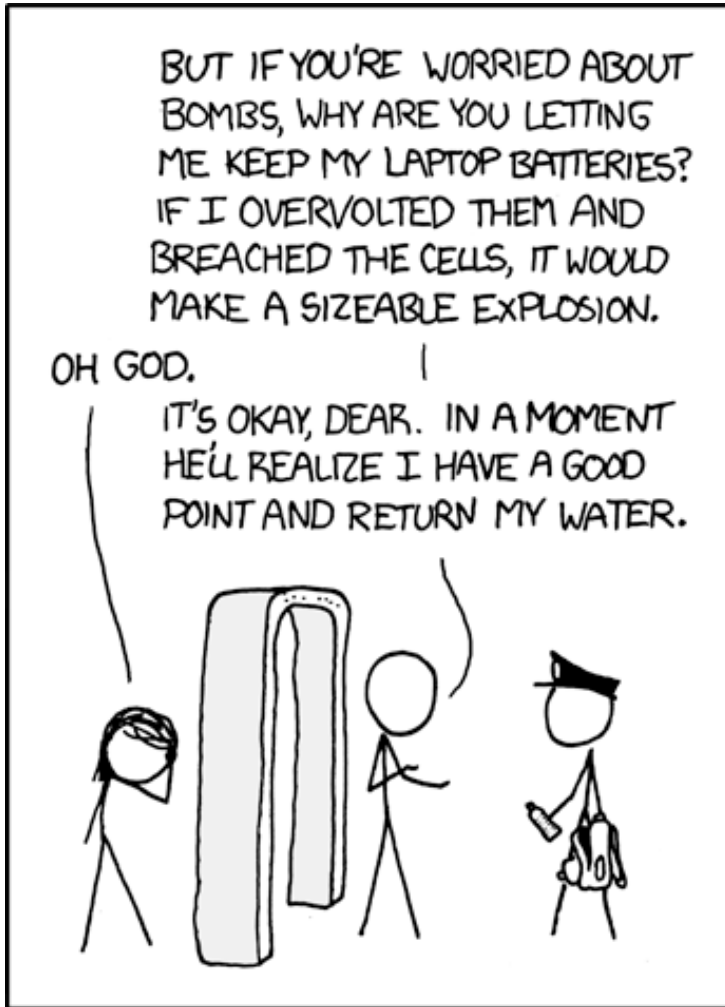
Megan wonders if this is her viewpoint, and imagines herself riding a dinosaur, probably an Apatosaurus, suggesting that she would rather be doing just that. This, and the title text are saying that the likelihood that out of all the possibilities in the universe, the chances that the one single place you would most want to be is just sitting with your significant other is fairly low.

The title text is Megan's comment to Cueball, where she asks him if he is serious, when there are like a thousand species of Dinosaurs he could be riding (or running from).

Previously, in 15: Just Alerting You, a person rode on a Brontosaurus which at the time of release of this comic was thought to just be an outdated name for Apatosauruses. This was made clear a few comics earlier in 636: Brontosaurus. Apatosauruses are also mentioned in 460: Paleontology.

#651: Bag Check

October 19, 2009



A laptop battery contains roughly the stored energy of a hand grenade, and if shorted it ... hey! You can't arrest me if I prove your rules inconsistent!

Explanation

Cueball argues with a TSA agent at an airport security checkpoint over the TSA policy of prohibiting airline passengers from bringing liquids or gels in quantities greater than 3.4 ounces (100 ml) in their carry on items. In an attempt to prove his point, Cueball points out that if he did want to make a bomb, he could simply take the lithium ion battery from his laptop computer to turn into an improvised explosive. Cueball is attempting to point out that the security policy is missing the forest for the trees, however, because the explosive properties of lithium ion is not common knowledge, this instead simply makes the security team additionally suspicious why he would know that.

The title text continues Cueball's line of argument, segueing into a protest as the situation escalates to the point of Cueball apparently being placed under arrest, again with the joke being that even fewer people still would know how explosive a hand grenade is. This is, however, a bit of an exaggeration, as for them to place someone under arrest, they need real reason to think that they are going to do something bad, and simply knowing this information is not enough to justify this action.

Interestingly, in 2017 a ban on laptops and other large, battery-equipped devices (but not smartphones) in the cabin was initiated by the United States, and followed by other countries, with the stated aim of lowering the risk of somebody bringing an explosive onto the plane inside

it. Granted, this was in response to a Somali incident where a bomber snuck a laptop loaded with actual explosives (not just the batteries) onto a plane, but the similarities are still quite evident.

#652: More Accurate

October 21, 2009



We live in a world where there are actual fleets of robot assassins patrolling the skies. At some point there, we left the present and entered the future.

Explanation

This comic spoofs the Terminator series, in which a super-intelligent machine from the future time travels back in time to kill Sarah Connor. As could be expected from a movie, the antagonistic robot is a human-like android.

However, we currently have military "robots" (actually vehicles controlled remotely by people) that are completely unlike anything in the movie. Originally, UAV were only used for surveillance and reconnaissance. But, now more than ever, they are used for attacks. And most importantly, they are not walking humanoids but flying machines. They are not restricted to carrying human-intended guns as in the movie but are armed with powerful explosives and long-range missiles. Thus the name of the comic: Randall points out being attacked by a flying plane-like drone -- such as the Predator drone shown in the last panel (heavily used for offensive operations by the USAF and the CIA in Afghanistan and Pakistan) -- is a much more accurate outcome should the robots rise up against humans.

It is important to note that, in the actual Terminator 1 movie, this substitution would not actually be so simple. The terminator sent back in time knows Sarah Connor's name and city of residence, but not her appearance or address; it locates her by looking her up in a phone book (and ends up killing a number of other women with the same name, as well as its intended target's roommate,

before finding the correct Sarah Connor.) Additionally, the terminator regularly operates inside buildings and rearms itself by picking up human small-arms. A Predator-type drone, while a superior killing system, would be unable to do any of that.[citation needed] A drone which could interact with and operate in the human environment with the ease the terminator displays (let alone successfully disguise itself as a human) would be a major accomplishment which no real-world project has yet come close to.

Yet another consideration is that Skynet didn't know how Sarah Connor looked like. All they knew is that she had metal stud in her leg. It would be incredibly hard to identify Sarah from other humans from such high altitude — and it would be hard to land in the middle of a city, even if a landed drone could then do anything useful. Multiple other Sarah Connors were killed by mistake; it's likely a UAV would run out of missiles long before humans run out of Sarah Connors.

One thing that keeps us short of a Terminator scenario is that most of the unmanned aerial vehicles are either pre-programmed or flown remotely by members of the military, and are not left to their own devices.

The title text emphasizes this by pointing out that we have entire fleets of these drones, and notes that at some point, we entered the future.

Similar buildup and Terminator reference are to be found in 1177: Time Robot.

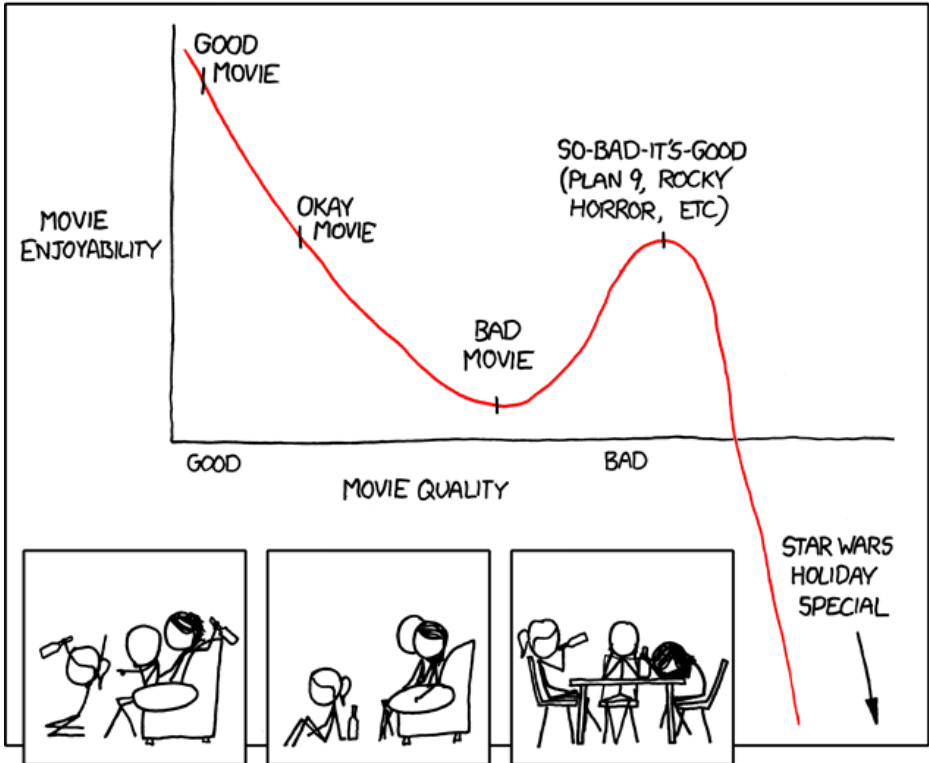
10 years after this comic was published, almost to the day, a movie in the Terminator franchise called Terminator: Dark Fate came out which includes a scene very similar to this comic involving a Predator drone being used by the super-intelligent machine to take out its target. Also, shortly after that movie came out Randall published a comic about it with the same name.

Yet another possible error is that Predator/Reaper-like drones are going to be outdated in the future; while they will be used as reserve or surplus weaponry, Skynet would never send something as outdated to such important mission. Actual state-of-the-art aerial UAV of said time period would resemble modern UAV about as much, as Cold War-era tanks resemble World War 1 tanks. The Terminator movies do actually use aerial hunter-killer drones, and versions of these are seen (and used) in the 'present day' scenes of at least one of the sequel films. However, these are prototypes that are not yet openly deployed (and only do so, in that film, under the influence of the future's 'bad' terminator and for the benefit of the rise of the nascent Skynet). Under the general circumstances of the first film, especially, there's no indication that there's any opportunity for Skynet (not yet existing in the 'present', and constrained by what nature of machines it can send back in time from its future) to employ a futuristic Hunter-Killer of any kind. Indeed, at the time of the first movie, even a future terminator would be hard pressed to hack into the 'semi-autonomous drones' that effectively did not exist.

#653: So Bad It's Worse

October 23, 2009

PROTIP: EVEN AT "BAD MOVIE NIGHT,"
AVOID THE STAR WARS HOLIDAY SPECIAL.



You think it's so legendarily bad that you'll torrent it and sit through it just for the kitschy nerd cred. I, too, once thought as you did.

Explanation

The graph in the comic shows the enjoyability of movies - going from good to okay to bad, then popping back up with "So Bad It's Good". The term is used to describe movies that are so terrible that, ironically, watching them is actually an enjoyable experience, even if just to poke fun or marvel at the absurdity of how bad they are. The comic lists Plan 9 from Outer Space and The Rocky Horror Picture Show, two widely known films of this type.

However, the graph warns of showing The Star Wars Holiday Special, as it manages to wrap back around from "So Bad It's Good" to being So Bad it's Horrible. The Star Wars Holiday Special is a prime-time comedy special based on Star Wars. It is widely known for its terrible quality, and has never been fully released (although an animated segment that introduced Boba Fett, which George Lucas has approved of, has been released as a bonus feature on a DVD).

The bottom of the comic shows Cueball, Megan, and Ponytail watching a movie with alcohol - first enjoying it, then merely watching, then not watching it and unhappily drinking.

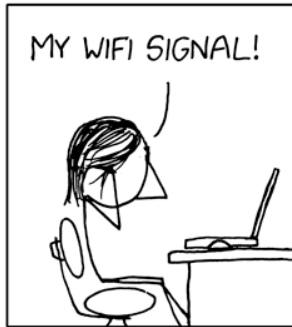
The title text refers to torrents, which are a way to obtain large amounts of data over the internet. Since the Holiday Special was only aired once on television and was never released on VHS or DVD, torrents of the TV

recordings are one of the few ways to actually see it. According to Munroe, he had torrented a copy of the film and intended to watch it in its entirety, in spite of its terribleness, just to cement himself as a nerd. However, he underestimated how bad it really was, and could not make it all the way through.

The title text may also contain an subtle play on a line of Star Wars dialogue. In Return of the Jedi, Darth Vader says to Luke Skywalker, "Obi-Wan once thought as you do. You don't know the power of the dark side! I must obey my master." The implication here being that "kitschy nerd cred" is the "dark side" being served by those who would sit through a torrent of The Star Wars Holiday Special.

#654: Nachos

October 26, 2009



'Cheater!' 'Hey, gaming on wifi? You have only yourself to blame.'

Explanation

Megan and Ponytail are playing together on an online multiplayer shooter game. Ponytail calls Cueball, who is living with Megan, and easily persuades him to make nachos. Wi-Fi and microwave ovens both use radio frequencies around 2.4 GHz, so Cueball's cooking disrupts Megan's connection and allows Ponytail to kill Megan's character. Boom! Headshot is a catchphrase made popular through a web mockumentary series called Pure Pwnage, and is also used in the game League of Legends by the character Caitlyn.

The title text points out that Megan has only herself to blame, as gaming on WiFi is susceptible to such issues, while gaming with a wired connection (e.g. Ethernet) is not.

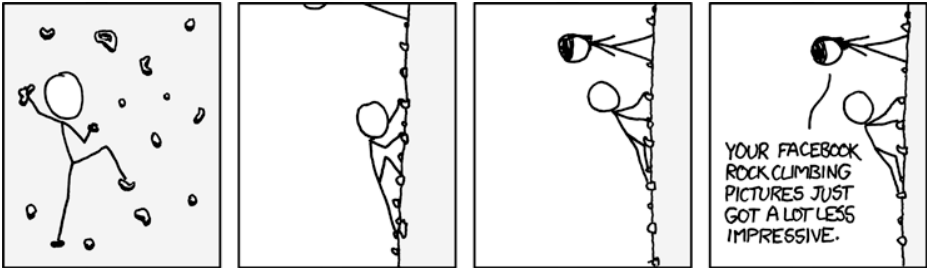
Note: If using the microwave actually does interfere with your WiFi, then get another microwave. Not (strictly) because it would mess with the WiFi, but because your microwave has a hole somewhere and is leaking non-ionizing radiation it shouldn't. It won't kill you, but it's not operating at peak efficiency. See this video on the subject.

Around the time of this comic's release, the xkcd website was temporarily redesigned using Yahoo! GeoCities. Snapshots of the site at the time can be found on the Internet Archive Wayback Machine.

This was the fifth time Megan is drawn and given the name Megan in xkcd, the first time being in 159: Boombox. Once in between this and the previous of these comics (478: The Staple Madness), her name was used in 596: Latitude, but she was not drawn there.

#655: Climbing

October 28, 2009



Where did you even get this wall? Return it there and stand it back up right now.

Explanation

This comic makes fun of a certain type of images very common on the internet. Those pictures are taken with a camera turned by 90° or rotated later by software, thus creating the illusion of people walking on walls or ceilings. While the original pictures depict the physical impossibility of a rotated gravitational force, Cueball uses the aforementioned technique to create pictures of himself on a climbing wall. Megan approaches him from above the wall, indicating that the climbing wall is in fact lying on the floor. It becomes clear that Cueball was not able to climb a real wall and therefore crawled on the floor with his camera adjusted accordingly.

Her comment is a sideswipe on the practise of self-display on Facebook, which is often done with the help of image manipulation.

The title text implies that Cueball has in fact stolen a real climbing wall, and that Megan wants him to return it.

An alternative reading is that Cueball could be climbing a relatively easy climbing wall, and the joke is it's so easy that Megan can walk on it, and Cueball is so bad at (or new to) rock climbing that he might perceive it as hard; thus, Megan impresses the viewers more than Cueball by showing how easy the course is.

#656: October 30th

October 30, 2009



Not enough houses on your block? Just hit them at 30-year intervals from here to 2300 and get 10x the candy.

Explanation

For Halloween, a child has dressed up as Dr. Emmett L. Brown (played by Christopher Lloyd) from the Back to the Future film trilogy. In the films, Brown created a time machine out of a DeLorean DMC-12 car, which he and teenage protagonist Marty McFly use to travel through time.

The joke of the comic is that Halloween is on October 31st, and by showing up dressed as Doc Brown on October 30th, the kid can make the joke that he "overshot" the time machine and went back one more day than he meant to. Doc is heard throughout the movie franchise saying "Great Scott" as an exclamation of surprise.

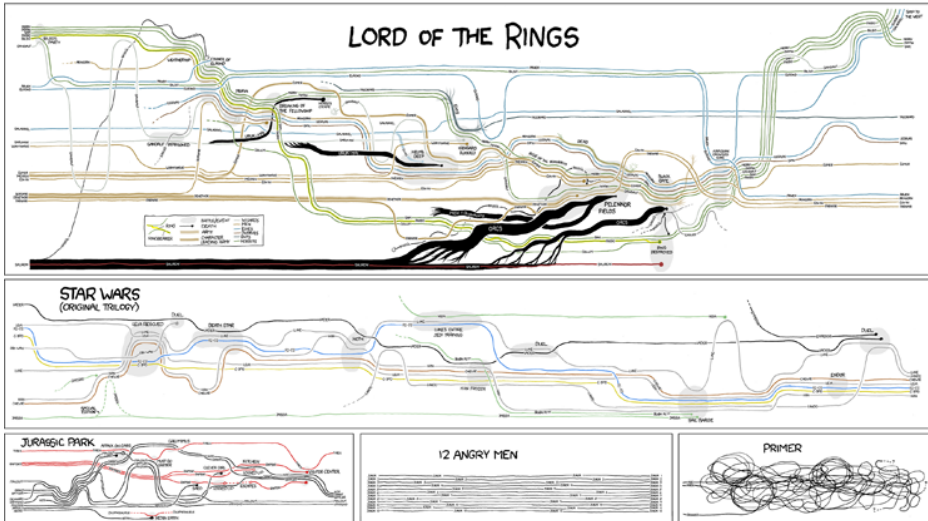
The title text flips the joke on its head by insinuating that the child really time traveled. It does this by suggesting an inventive use of time-travel to get ten times the candy — hitting each house at a 30-year interval up until 2300. This would only be possible if the child was really time traveling, and not, as the comic suggests, pretending to time travel. The interval matches that of the first two BTTF movies, which take place in the years 1955, 1985 (the present at the time), and 2015.

Of course, one would have no idea starting off if Halloween is still being celebrated in 2300.

#657: Movie Narrative Charts

November 02, 2009

THESE CHARTS SHOW MOVIE CHARACTER INTERACTIONS.
THE HORIZONTAL AXIS IS TIME. THE VERTICAL GROUPING OF THE
LINES INDICATES WHICH CHARACTERS ARE TOGETHER AT A GIVEN TIME.



In the LotR map, up and down correspond LOOSELY to northwest and southeast respectively.

Explanation

These charts show movie character interactions. The horizontal axis is time. The vertical grouping of the lines indicates which characters are together at a given time.

Lord of the Rings Trilogy[edit]

A mass of colored lines weaves back and forth across the chart, representing various characters. Sauron is represented by a red bar at the bottom contained within a huge black bar with branches, that in turn represents his army of nazgul, orcs, etc. Major locations (Moria) and plot points (the breaking of the fellowship) are marked. Gandalf, especially at the beginning, jumps all over the map in a short time. Eagles appear and then disappear a couple of times. Treebeard's line is flat except for the march to Isengard. At the end, the ship to the West drifts off into a corner. The hobbits start off in the top left with Frodo, Sam, Merry, and Pippin with Bilbo with them for a short time because of the party at the beginning. They go off on their adventure and briefly encounter Gandalf. They are then split up for a short time but meet back up at Weathertop when the Nazgul attack and they meet Aragorn (Strider at that point). They meet up with the rest of what becomes the fellowship of the ring at the council of Elrond at Rivendell. The newly formed fellowship must then venture into the mines of Moria which is referenced in comic 760 and comic 1218. After encountering the Balrog and the later death of Boromir the fellowship splits up. Frodo and Sam take the ring and go off on their own to destroy it and sneak into Mordor with the help of Gollum. Merry and Pippin are captured by the Uruk-hai but escape while the Uruk-hai battle Eomer and his

army. Eomer and his army then briefly unite with Legolas, Gimli, and Aragorn while Merry and Pippin find Treebeard and flood Isengard. While Merry, Pippin and Treebeard are flooding Isengard, Aragorn, Gimli, and Legolas fight at Helm's Deep with Gandalf and Eomer and Theoden. Aragorn, Gimli, and Legolas go to wake the army of the dead while Pippin goes with Gandalf and Merry goes with the Rohirrim. All of these people rejoin for the battle of the Pelennor fields where Eowyn kills the witch king after Theoden dies along with Denethor. The orcs, men and oliphants are all destroyed and Aragorn releases the army of the dead. All the surviving members of that battle go to the Black Gate except Eowyn and Faramir. Sam and Frodo destroy the Ring, Gollum dies and everyone who is still alive is there for Aragorn's coronation. Everyone goes back to their respective homes except for Frodo, Gandalf, Elrond, Galadriel, and Bilbo who get on a ship to the west.

As the title text points out, most of the plot of The Lord of The Rings occurs on a rough northwest to southeast axis, with the Fellowship of the Ring traveling from the Shire near the top of chart to Mordor at the bottom of the chart (and back again.) The most significant exception to the northwest-southeast axis is the area of the chart between "The Breaking of the Fellowship" and "Isengard Flooded." Helm's Deep and Isengard are southwest from the overall northwest-southeast axis of the movies.

Star Wars (original Trilogy)[edit]

Luke, mostly accompanied by R2-D2, joins and parts from other sets of characters. There's a dotted alternative path on Jabba's line for the special edition. A dark line representing Vader, travels through the duel where he kills Obi-Wan and proceeds to the

Death Star to meet with the main characters for the first time. Vader travels to Hoth where all the characters escape and goes to Cloud City where Han is frozen. He then duels Luke before going for a long time alone and confronts Luke for a short time before taking him to the Death Star II where the climactic duel happens and he is killed. Leia at first with C-3PO is captured and placed on the Death Star before being rescued and proceeds to Hoth, Cloud City, the Sail Barge and finally to the Battle of Endor before reuniting with all the survivors. R2D2 and C-3PO are mostly together save for when Luke is attacking the Death Star and Luke's Jedi training. Luke's line swerves through most of the scenes, breaking away from the other characters during the Jedi Training, the duel on Cloud City and the duel on the Death Star II. Han and Chewie are always together as they go through all the scenes. Greedo, Lando and Boba all appear in their respective scenes. Yoda appears about halfway through (where Luke's Jedi training is marked). All the surviving lines group up at Endor except for Vader, the Emperor, Luke, and Lando; after the climactic duel, the latter two join the rest.

Jurassic Park[edit]

The human characters are in black; dinosaurs are in red. Dilophosaurus appears briefly to devour Nedry and then fades out again. the T-Rex appears at the start and swoops down on the cars and eats Gennaro. It then weaves out until the end where it eats the raptors. The three raptors are together at the beginning, but split up about halfway through. One has a dotted portion of line between "locked up" and "escapes." In the meantime, they cut off the lines of Arnold and Muldoon. Malcolm, Grant, Sattler, Hammond and the kids all weave in and out of their respective scenes. The raptor lines all end when t-rex's swoops down to meet

them at the end, and all the surviving humans leave together. At the beginning Grant, and Sattlers Lines swap in an apparent error.

12 Angry Men[edit]

This is a very famous trial film that tells the story of a jury made up of 12 men as they deliberate the guilt or acquittal of a defendant on the basis of reasonable doubt. Only one of these angry men believe the defendant may be innocent and he argues this against the other 11, eventually convincing them that there is reasonable doubt in the case.

The lines are labeled Juror 1 through Juror 12. They are all perfectly horizontal and parallel.

The joke in the 12 Angry Men graphic is that in the movie all 12 jurors (the angry men) are in the same room for the entire duration of the movie. They never move and they all always interact with each other, hence their lines stay straight and close to each other.

This is actually not entirely true. The movie begins in the court room; a couple of times during the proceedings, a few jurors go into the washroom and have a brief discussion there; and finally, in the very last scene, two jurors have a brief exchange in front of the courthouse. In fact, this chart would actually become a useful reference to the film if each of the jury's votes sessions was shaded as battles/events, and each juror's vote shown on their line, tracking when each juror's vote switches from 'guilty' to 'not guilty'. But as far as the characters' locations, there is no need for such a narrative chart, and that is the joke.

Primer[edit]

The last box is a movie called *Primer* from 2004, which became a cult classic. It is about a group of engineers who discover a way to travel through time, but only in one direction (backwards) and only at the speed of regular time (i.e. you have to stay in the time machine for one hour to move an hour back in time). Because of this, the story ends up having multiple versions of the same person existing at the same time; the plot and time-travel mechanics are notoriously hard to follow, so that it is almost impossible to figure out where each character is at one time, as the comic illustrates.

Three lines start on the left labeled Abe, Aaron, and Granger. They enter a mass of scribbling. Somewhere vaguely towards the end, three lines emerge and fade out, all labeled with question marks.

The chart for *Primer* is referenced in the title text of the fourth image in the what if? Plastic Dinosaurs.

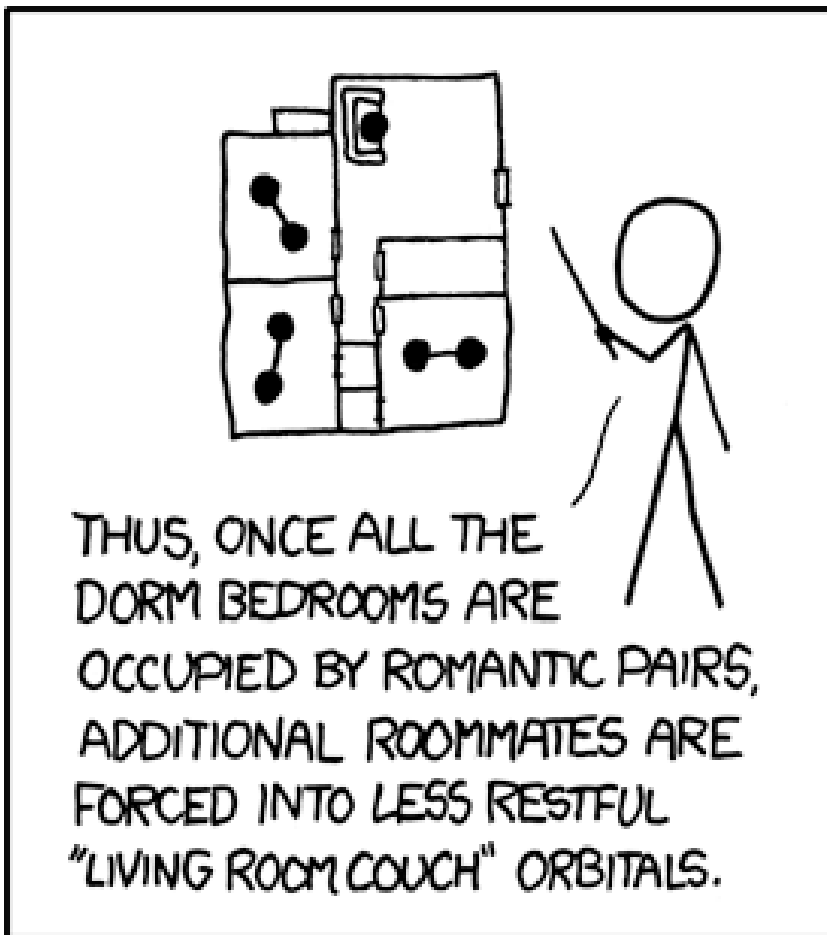
Background[edit]

These charts are a reference to "Napoleon's March," the map and statistical infographic by cartographic pioneer

Charles Joseph Minard. It details the movements and losses of Napoleon's troops on his failed conquest of Russia. The size and location of Napoleon's army are represented by tapering streams similar to the design used for Sauron's and Saruman's troops in the LotR Chart. Minard's chart is extensively discussed by Edward Tufte in his book *The Visual Display of Quantitative Information*, and he summarizes some of that on his website.

#658: Orbitals

November 04, 2009



THE PAULI SEXCLUSION PRINCIPLE

Except the people filtering in late are the partiers, so you end up with drunken makeouts in the living room and the next roommate to return home has to sleep in the hall lounge orbital.

Explanation

When determining where to place electrons in atoms, three rules are generally used: the Pauli exclusion principle, the Aufbau principle, and Hund's rule. The Pauli exclusion principle, from which the pun is derived, states that no two electrons (or indeed any fermion) can occupy the same atomic state. Therefore, any electron orbital is limited to two electrons: one with a $\frac{1}{2}$ spin, and the other with a $-\frac{1}{2}$ spin. The Aufbau principle states that lower energy orbitals are occupied previous to high energy orbitals. Hund's rule states that electrons will try to fill orbitals individually, and only pair up when every orbital has a lone electron in it.

In the comic, electrons are being equated to people, and rooms (or couches) are equated to orbitals. The reverse of Hund's rule is then followed: people will try to pair up in a room first, and only when all the couples have done so will rooms be allocated to single people. The Pauli exclusion principle here means that only two people can occupy a room at a time (should those people be romantically involved), as most people are generally uncomfortable being in a room with people engaging in intercourse.[citation needed] The Aufbau principle therefore means that more restful rooms are filled previous to less restful rooms.

The title text jokes about drunken party-goers, who ignore the Pauli principle perhaps out of inebriation. They then end up partying and sleeping together with

many people in the living room, leaving the roommate stuck in the third desirable location, the hall lounge.

#659: Lego

November 06, 2009

WHEN YOU TAKE APART A
LEGO HOUSE AND MIX THE
PIECES INTO THE BIN, WHERE
DOES THE HOUSE GO?

IT'S IN THE BIN.



NO, THOSE ARE JUST PIECES. THEY
COULD BECOME SPACESHIPS OR TRAINS.
THE HOUSE WAS AN ARRANGEMENT.
THE ARRANGEMENT DOESN'T STAY WITH
THE PIECES AND IT DOESN'T GO
ANYWHERE ELSE. IT'S JUST GONE.



Dad, where is Grandpa right now?

Explanation

Lego is a popular brand of building toy, which Cueball here uses to describe a philosophical conundrum: the distinction between a composition and the collection of parts that make up that composition. For example, the pieces of Lego that he and his daughter, Ponytail, used to make a house are still around; they were put back into the bin, and can be used on future designs. However, the house itself, as a specific combination of those blocks, is gone. It ceased to exist when they took it apart. In essence, they "killed" the house. Those elements could be used to build a car or an airplane, so if there is still a house in the box after it has been dismantled, then there is also a car in the box and a plane in the box, and a large number of other objects in the box: making it a very crowded box. Thus, it is more logical to consider the house to be one possible arrangement of the LEGO® brand building bricks that only exists when the blocks are put into that arrangement.

Another possible way of thinking about this is that the house never existed; it was just pareidolia turning a random arrangement of lego blocks into a "house".

Later in her life, Ponytail extends this thinking to humans and organ donation. The US has an opt-in system for organ donation; in the event that you die, any of your organs or tissues that remain functional after your death can be donated for transplantation or medical research, provided you've opted into the organ donor

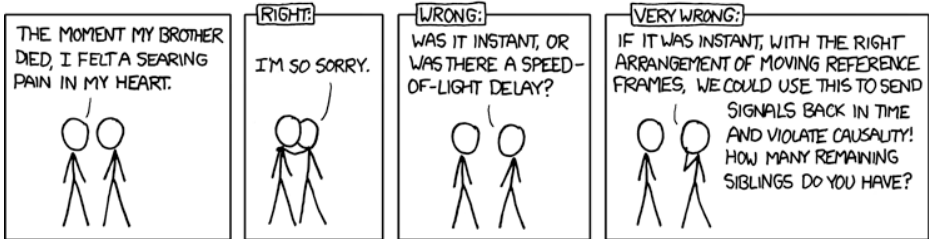
registry. Ponytail compares her organs to the Lego blocks she's carrying - even if she (the composition) dies, her organs (the pieces) can continue to serve another. As such, she is compelled to register as an organ donor.

The title text is the same question asked in the first panel, from this new perspective - instead of asking where the Lego house went, the questioner (presumably a young child, possibly still Ponytail) is asking where their Grandpa went. Humans are a composition of many parts; the parts are usually buried or cremated when we die, but the composition is something else entirely. What exactly happens to a human composition after death is a question for religious debate, but we know for sure it doesn't stay here. Alternatively, if Grandpa chose to donate his organs (or, because the final decision is actually made by the deceased individual's family, if Cueball and Grandpa's other relatives choose to have Grandpa's organs donated), Grandpa would be in multiple other people, assuming that at least some of his organs were fit to be donated when he died.

#660: Sympathy

November 09, 2009

SYMPATHY TIPS FOR PHYSICISTS



Excellent recovery: ... which we could try to use to somehow save your original brother!

Explanation

This comic plays at the lack of social skills physicists and other people in heavily scientific disciplines are stereotypically believed to have. The example displayed is a case of condolence, in which the appropriate behaviour would of course be to express compassion with the bereaved, as shown in the second panel.

In the third panel, the physicist fails to display the endorsed demeanour. Instead, he takes a scientific approach towards the statement of his friend. He points out that the transmission of the pain the latter believes to have felt, is in fact limited by the speed of light and could therefore not have been 'instant'. By saying so, he betrays an absence of feeling towards his friend, as well as his inability to understand the figurative sense of the words.

In the last panel, the physicist takes the previous to a bizarre extreme and reflects on the consequences that would follow if the statement of his friend were indeed literally true. According to special relativity, any object travelling faster than at the speed of light would in fact move backwards in time. The physicist therefore plans to utilize this effect in order to construct a tachyonic antitelephone, a device that allows sending information to the past. To confirm the initial condition, he makes the utterly inappropriate proposal to start a series of measurements with other family members of his friend.

A correction of the misdemeanour is suggested in the

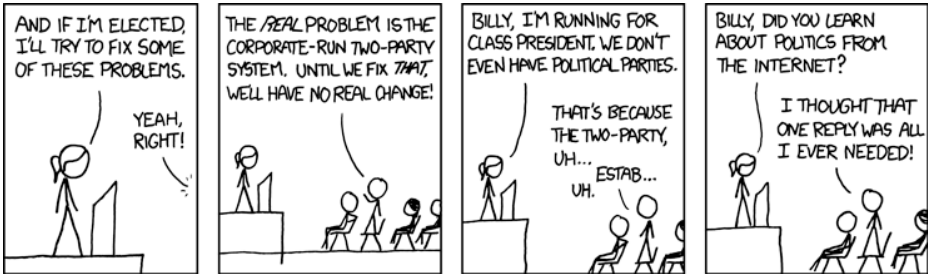
title text: The antitelephone might be used to change causality and save the original brother from dying in the first place. Of course, saying the latter would not be of much help in the given scenario, although it does serve a noticeable improvement over the last two panels.

Note how he says 'original brother', noting that although he would have saved his brother, another family member would have to have been killed to do so.

The use of right/wrong/very wrong is also presented in 803: Airfoil.

#661: Two-Party System

November 11, 2009



I favor approval voting or IRV chiefly because they mean we might get to bring back The Bull Moose party.

Explanation

Ponytail is running for class president, but gets shouted down by Billy the Political Activist (or at least, he thinks he might become one some day). Someone on the Internet must have told Billy that all he has to know about politics is that America's two-party system is broken. Because we all know the problem with believing what you read on the Internet.

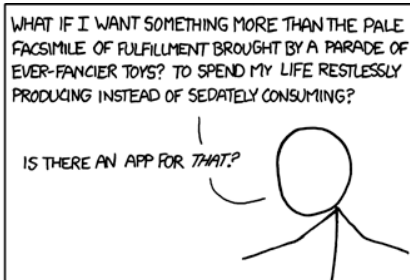
The United States uses Plurality voting, where each voter may make one vote per office. In most democratic countries, this system tends to reinforce the top two political parties and marginalize smaller ones (such as the Bull Moose Party, which only lasted from 1912 to 1916) though this is greatly pronounced in the United States, where the Democratic and Republican parties have passed many barriers to entry, making things much more difficult for parties other than themselves to gain any traction.

Approval voting (AV) and Instant-runoff voting (IRV) are alternative voting schemes that allow support for multiple candidates. Such systems might make it easier for 3rd parties to field viable candidates. AV is a simple extension of plurality voting where each voter "approves" as many of the candidates as they wish. The winner is the candidate with the most votes. Approval voting tends to favor moderate candidates with broad appeal. IRV is a form of Ranked choice voting where a voter is allowed to select multiple choices, but must assign a rank or weight

to each choice. If a candidate receives more than 50% of all 1st choice votes, they win as in a traditional election. If no candidate has a majority of 1st choice votes, the candidate with the fewest 1st choice votes is eliminated, and those 1st choice votes are replaced by their respective 2nd choice option and the resulting totals are compared for a 50%+ winner. This process is repeated until a winner is determined.

#662: iPhone or Droid

November 13, 2009



It may be a fundamentally empty experience, but holy crap the Droid's 265 ppi screen is amazing.

Explanation

The comic starts to set up a joke about the "phone wars" between the iPhone and phones that run the Android system (in this case the Motorola Droid), but instead just brings up a serious point criticizing the consumerism this "war" stems from. In the last line of panel 2, Cueball refers to the slogan "There's an app for that" from Apple's iPhone marketing.

Then the third panel makes a joke anyway, at Apple's expense: apparently, this "enlightenment app" was rejected from Apple's app store, which is the only supported way to put third-party software on an iPhone. Apple has become infamous for rejecting apps from their app store without adequately explaining why. (Users of iPhones can sideload third party software using jailbreaking or developer tools, but both are quite complicated.)

In the title text Cueball succumbs to the consumerism and marvels at the Motorola Droid's high (at the time) pixel density. Apple responded 9 months later by releasing the iPhone 4 with a 326 ppi Retina Display. (Higher pixel densities are now standard for smartphones.)

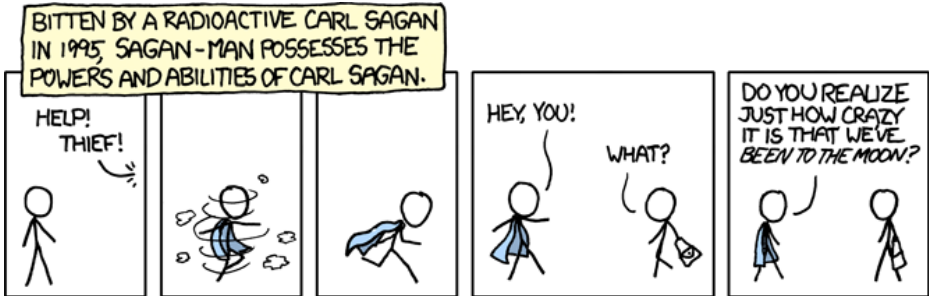
This comic was written at the start of the modern smartphone era, when first the iPhone and then Google's Android platform had popularized user-installable third-party apps for smartphones. Previously third-party

smartphone apps had been much rarer as they were hard to develop and install, and smartphones themselves had been considered quite hard to use. iOS and Android, running on touchscreen smartphones with considerably more hardware resources than earlier smartphones, had encouraged the development of third-party apps and their sale on app stores, with Apple advertising "there's an app for that" to showcase the range of apps available for its phones.

Although the concept of an app that delivers "something more than the pale facsimile of fulfillment brought by a parade of ever-fancier toys" sounds ridiculous, mindfulness apps have since become reasonably popular.

#663: Sagan-Man

November 16, 2009



They laugh now, but within 10 years the city's entire criminal class will have quit to work on space research.

Explanation

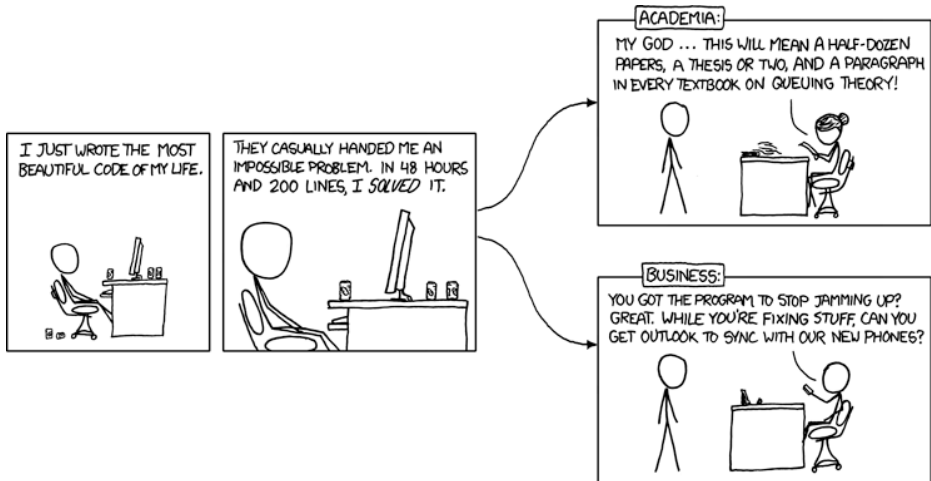
Carl Sagan was an advocate for science, space and SETI (Search for Extra-Terrestrial Intelligence). He wrote the book *Contact*, which was later made into the movie by the same name. While Sagan did not emit anomalous radiation in his lifetime,[citation needed] he did receive acclaim in the field of radiology, namely for using radiation to synthesize amino acids from simpler chemicals.

This comic is parodying Spider-Man, in which Peter Parker is bitten by a radioactive spider to become Spider-Man. In this comic "a radioactive Carl Sagan" turns the person into "Sagan-Man". Apparently, Sagan-Man is able to stop thieves in their tracks by blowing their minds with inspiring scientific facts.

The title text implies that Sagan-Man's vivid imagery inspires the entire "criminal class" to give up their anti-social ways and turn to space research.

#664: Academia vs. Business

November 18, 2009



Some engineer out there has solved $P=NP$ and it's locked up in an electric eggbeater calibration routine. For every `0x5f375a86` we learn about, there are thousands we never see.

Explanation

Cueball has solved some tricky and very important problem in computer science, related to queueing theory.

The comic splits into two timelines. In the first he is showing the brilliant solution he'd developed to somebody who can appreciate its elegance, in this case that being an academic who can see the programmer's true brilliance and get him much-earned plaudits from the academic community.

In the alternate timeline, the boss does not possess the knowledge required to comprehend its import, and he simply sees the results without caring about the means Cueball used to attain them. He then gives Cueball another assignment, that may be vastly more workaday in nature. This, sadly, is the usual course of events in bureaucracy, which only seems to care about your results, not how you came about them. To drive in the point, the boss asks Cueball to do something as simple as setting up email on the office phones, a stark contrast to the skill and creativity Cueball would have needed to write his code in the first panel. It may even be imagined to be a "reward in itself" to casually hand over this new problem, however unsatisfying (or unsatisfiable) the new technical issue truly is.

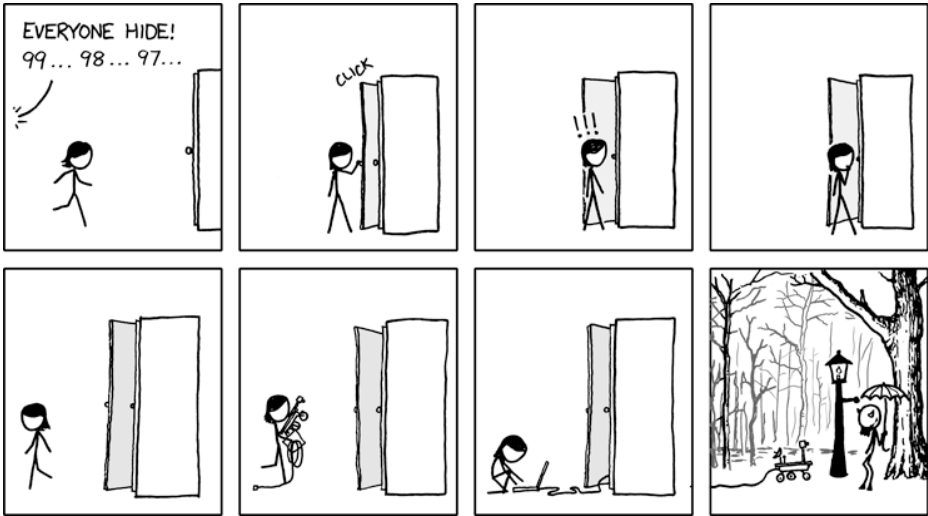
The references in the title text are to the P versus NP problem, a famous unsolved problem in computer science, and the "magical constant" (0x5f375a86) used in

finding the fast inverse square root, i.e. solving $y=1/\sqrt{x}$ as fast as possible through a program – no-one knows quite who came up with this very useful bit of code (Now believed to be devised by Greg Walsh at Ardent Computer in consultation with Cleve Moler, the creator of MATLAB), but it was discovered hiding in the graphics code of the video game Quake III Arena. Note that the actual constant used in the Quake III source code is 0x5f3759df, but the constant in the title text works also, and is actually slightly more accurate as shown in this paper: Fast inverse square root by CHRIS LOMONT (Purdue university, 2003).

The title text may be a reference to Stephen Jay Gould's quotation: "I am, somehow, less interested in the weight and convolutions of Einstein's brain than in the near certainty that people of equal talent have lived and died in cotton fields and sweatshops." originally about how great minds are suppressed due to racism and their genius go unknown, but could be interpreted as general exploitation by the commercial world.

#665: Prudence

November 20, 2009



Moments later, the White Witch rolls up and, confused, tries to tempt the probe with a firmware upgrade.

Explanation

This comic references the fantasy novel series *The Chronicles of Narnia* by C. S. Lewis. In the first published book (second chronologically), *The Lion, the Witch and the Wardrobe*, Lucy discovers the fictional world of Narnia which can be accessed through a wardrobe, and she walks into it without ever considering the risks. Her three older siblings do not believe her, so she travels back alone again. But this second time her brother Edmund follows her, and he is seduced by the White Witch in order for her to be able to kill him and his three siblings (see title text explanation below). Thus proving that it was a rather dangerous move to just walk into the wardrobe.

The comic mocks the imprudent behavior shown by the protagonist Lucy of the novel, who enters the world of Narnia without knowing anything about its dangers. In the comic, Lucy (drawn as a child version of Megan, clearly not adult as she only just reaches the wardrobes handles with her head), discovers the magical wardrobe while playing hide-and-seek, like in the book. Unlike in the original book, Lucy does not precipitately set foot into Narnia. Instead, she fetches her technical equipment and sends a remote-controlled probe through the wardrobe door in order to sound the situation first.

The probe encounters Mr. Tumnus the faun with his umbrella at a lamppost in a snowy wood on the last panel. This picture is the first impression of Narnia in the

novels and was apparently Lewis' original idea for the series.

The probe is clearly modeled after Mars rovers like Spirit and Opportunity, which Randall depicted for the first time only a few comics later in 681: Gravity Wells and then in 695: Spirit. The probe looks even more like the one in 1504: Opportunity. This also explains the title of the comic, as it is the name of Lucy's probe. The naming scheme is similar to the two probes mentioned above that were already on Mars at the time of this comics release. And even more so like the upcoming Curiosity rover which was first launched two years after this comic, but had been named earlier in the year this comic was released. Lucy was curious in the first Narnia book, but in this comic she is prudent.

The White Witch mentioned in the title text is the main antagonist in the novel. She originally lures Edmund with a hot drink and magical Turkish delight after her sleigh passes right by him. In the scenario mentioned in the title text, she is confused when she rolls up to the rover and then tries to tempt the probe with a firmware update accordingly.

The procedure of sending a probe first through a portal has also been used in the early Stargate episodes. This draws a parallel between the wardrobe in Narnia and the Stargate, both connecting two distant worlds. The stargate probe can be seen [here](#).

Megan (or Lucy) also takes a scientific approach to

Narnia in one of the comics of 821: Five-Minute Comics: Part 3. In that comic she uses the different passage of time in Narnia to her advantage (it usually runs much faster than on Earth). That effect would have been a problem with controlling the rover in this comic.

#666: Silent Hammer

November 23, 2009



I bet he'll keep quiet for a couple weeks and then-- wait, did you nail a piece of scrap wood to my antique table a moment ago?

Explanation

Black Hat has created a set of tools that work in complete silence so that he can go to the house of the chairman of the American Skeptics Society late at night, do some rearranging of walls and moving of windows, just to screw with him in typical Black Hat fashion. Imagine how surprised the person must be when they wake up and discover their whole house has been rearranged! A skeptic is someone who questions knowledge, facts and beliefs, especially of supernatural phenomena like the existence of poltergeists which Black Hat is trying to imitate with his rearranging and scratching noises.

The American Skeptics Society is a non-profit organization dedicated to promoting skeptical and critical thinking in education and public discourse. The executive director and chief editor of the Skeptic Magazine, Michael Shermer, is a leading proponent of skepticism, and has written many books and articles debunking pseudoscience, fringe science, quack medicine, alien abductions, conspiracy theories and supernatural phenomena. The Skeptic Society website and Skeptic magazine feature a lot of material debunking anecdotal accounts of these phenomena, explaining how events like "hauntings" could have occurred without supernatural intervention.

One of the premises of modern skepticism is that the supernatural is not rejected out of hand; if someone came up with a proper scientific hypothesis that predicted

something supernatural and that hypothesis was proven beyond reasonable doubt, a skeptic would accept that the supernatural thing in question was probably correct.

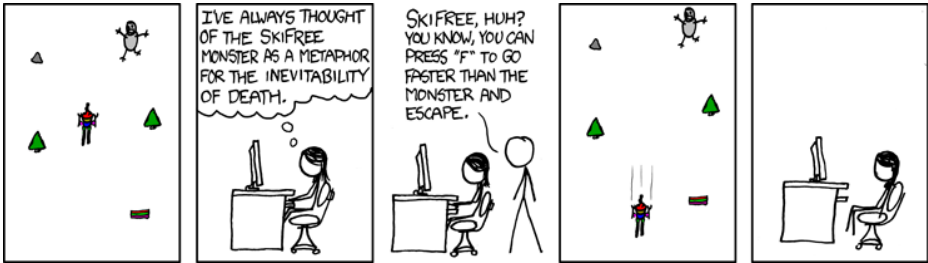
In the title text Cueball realizes that Black Hat has (probably intentionally) ruined his antique table by demonstrating his silent hammer on it in the first panel.

Black Hat's tools are seen in two boxes labeled "Drills" and "Non-Drills", likely a reference to the phrase "this is not a drill", used to differentiate an emergency situation from a practice of procedure for such.

Note that this comic is numbered 666 (number), the number of the beast in Christian theology, which is often associated with the evil and supernatural.

#667: SkiFree

November 25, 2009



And from that day on, I wore this little 'F' key pendant everywhere I went.

Explanation

SkiFree is a video game released in 1991 which enjoyed popularity on the desktop computers of the time. In the game, you're a downhill skier who attempts to ski down a hill while avoiding obstacles which cause you to crash (which slows you down). At the start of the game, you can choose to go down three different timed/scored courses, or ignore them all and ski freely. Beyond the end of the courses you can continue skiing downhill. You can also move (slowly) uphill and sideways.

If you ski too far down the hill a monster similar to one in the comic will begin to chase you; contact with the monster ends the game. Since it's much faster than you normally, you'll get caught. The monster also appears if you travel too far in the sideways or upwards directions.

One of the lesser known commands in SkiFree is the 'F' key, which speeds you up, even faster than the monster. A second monster appears slightly further down the hill but by skiing downhill diagonally with the F key it is possible to evade both.

The joke here is that Megan has thought long and hard about the concept of the monster, relating it to the inevitability of death, and is nonplussed by the revelation that there is a simple mechanism that may allow her to escape it, thus ruining the poetic metaphor.

The title text refers to pendants or talismans that are

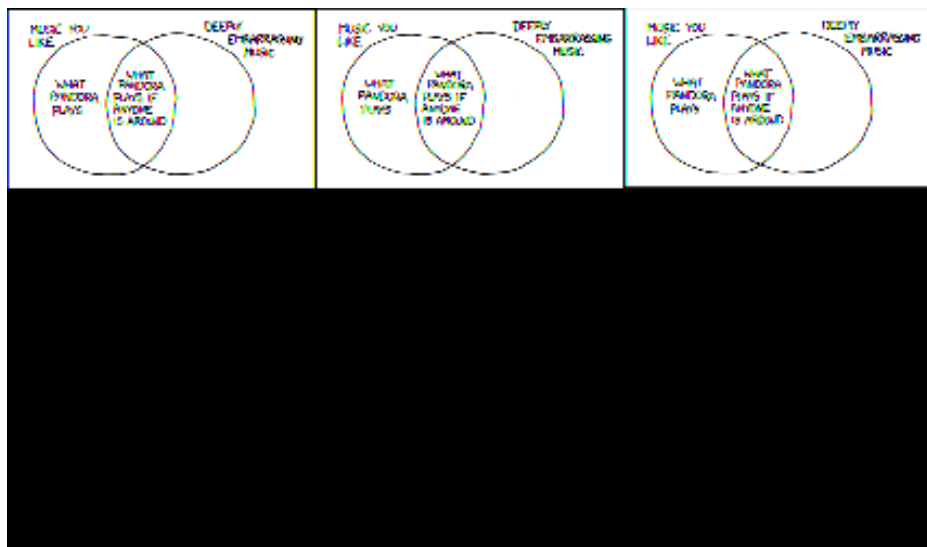
worn to protect oneself from harm or to remind oneself of an important truth. Megan, seeing that the F key allowed her to evade inevitable death in the game, comes to believe that the F key confers some sort of immortality.

Alternatively, it may be symbolic as the monster in SkiFree seemed insurmountable (just like death) but might have a discovery in the future (the 'F' key) that can overcome it.

An additional layer of anachronistic humour may be found for the future reader due to the significance of the 'F' key here differing from in a more recent meme the reader may be familiar with where the 'F' key represents mourning instead of an easy escape from death as seen here.

#668: Pandora

November 27, 2009



What? Oh, no, the 'Enchanted' soundtrack was just playing because Pandora's algorithms are terrible. [silence] ... (quietly) That's how you knoooooow ...

Explanation

Pandora is a website which automatically plays songs of a certain genre based upon the user's previous musical selections. Unlike normal radio, it adapts itself to each individual user's preferences, producing playlists that the user should find enjoyable based on the user's taste in music. In other words, Pandora plays music you will probably like.

One may not want friends to find out that one enjoys certain songs and/or certain kinds of songs ("embarrassing music"), for fear of looking childish, sentimental, etc. A recent example is the soundtrack to the 2013 film *Frozen*: although enjoying popularity and critical acclaim, it is considered by many to be embarrassing music, because they do not want others to know that they like a soundtrack to a Disney animated film.

One certainly does not want one's embarrassing music to be played on Pandora when others are around. The frequency of this depends on individual circumstances, but generally one's embarrassing music is a small fraction of all music one likes. However, due to biased memory, people remember cases where embarrassing music is played in others' presence far better than those where "acceptable music" is played. So it appears that when others are around Pandora only plays embarrassing music.

The title text presents an example of this, the music in question being the soundtrack to *Enchanted*, a fantasy romantic comedy film produced by Walt Disney Pictures. Despite the user proclaiming that the Pandora algorithm is terrible to explain why it's playing the *Enchanted* soundtrack, after a short period of silence the user quietly begins singing along to the song "That's How You Know" from the soundtrack, which is apparently the song currently playing.

#669: Experiment

November 30, 2009



The other two are still lost on the infinite plane of uniform density.

Explanation

Problems in the study of kinematics often idealize the environment of the problem for the sake of simplicity. Specifically, it is assumed that objects are moving in a vacuum and that there is no friction. Then the complicated effects of air resistance and surface frictions can be ignored, and the more basic principles of momentum and energy can be explored. In more advanced physics, it is often easier or necessary to ignore friction if the process being studied is very complicated. So it could be said that "physics professors like working in a frictionless vacuum" (with vacuums already being technically frictionless, it is implicit that this term refers to all surfaces found within that vacuum).

In the comic, Black Hat and Danish have interpreted that statement to mean that physics professors like doing their work while they are in a frictionless vacuum, instead of liking to work with problems which are set in a frictionless vacuum. Apparently, they have drugged a physics professor and put him in a glass dome (with his laptop so he can work) which they can evacuate, with the floor frictionless. The professor wakes up confused from the drugs, and as the air is pumped out to make a vacuum (presumably slowly enough to prevent explosive decompression from coming into play), his words fade to silence because sound waves requires a substance such as air to travel through. As he starts to panic, he tries to run, presumably for the door we see in the last panels. However, without friction on the floor, he cannot exert

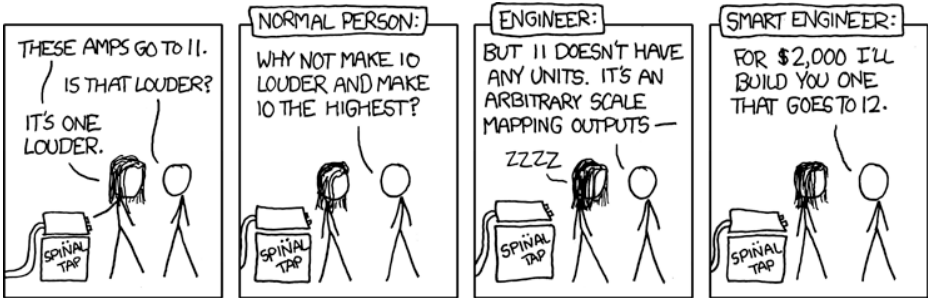
any force to move forward, and his feet skate uselessly on the ground until he loses balance and falls. At this point he is probably suffering from asphyxiation. Black Hat and Danish are observing from outside the dome, and decide that physics professors have lied about liking to work in frictionless vacuums, even though they almost certainly knew that the physicist would die, [citation needed] showcasing Black Hat's tendency to be a Classhole.

The title text refers to another common idealization, of an infinite plane of uniform density. An infinite plane extends forever in two dimensions, which makes calculations easier because surface-related properties are identical everywhere. "Uniform density" could refer to the mass density of the plane, or more likely an electric charge density, which makes a common problem in basic electromagnetism involving calculating the electric field. The "other two physicists" that Black Hat and Danish are experimenting on are lost on the infinite plane, since there are no edges or landmarks anywhere to give them direction.

It should be noted that, although a vacuum can be approximated using a vacuum pump, frictionless surfaces and infinite planes are only imaginary constructs and do not exist in our universe.[citation needed][actual citation needed]

#670: Spinal Tap Amps

December 02, 2009



Wow, that's less than \$200 per ... uh ... that's a good deal!

Explanation

This comic is in reference to the 1984 mock documentary *This Is Spñäl Tap* about the tour of the fictional rock band Spñäl Tap. Here we see lead guitarist Nigel Tufnel (a character portrayed in the movie by Christopher Guest) explaining to Cueball how the volume dial on his amp goes all the way up to eleven. This is impressive to Nigel since guitar amplifiers generally only have ten as the maximum setting. This leads him to believe his amp is "one" louder than other amplifiers.

In reality, the loudness of an amplifier is largely dependent on how much power is supplied to its electronics. Markings on the volume dial are merely an aspect of appearance and has no influence on the maximum achievable loudness. The highest mark could just as easily be labelled 'Maximum', which would then accurately describe the meaning of that setting. Thus, the phrase "goes to eleven" is often used sarcastically to mock people or statements that rely on arbitrary numbers without comparable units or context.

The comic then extends the joke by presenting three types of reactions from different people:

- The normal guy understands that using eleven is silly, and wants to know what is wrong with the usual way of numbering from one to ten -- the question that is raised in the original film, to which Nigel simply responds,

"These go to eleven."

- The engineer is desperate to explain to Nigel the fallacy in his thinking, but his jargon just sends Nigel to sleep. He remains unenlightened.
- The smart engineer sees an opportunity: it doesn't cost any more to number the volume dial differently, but Nigel places a real value on higher numbers. The smart engineer offers to sell him an amp that goes to twelve, but at a hefty premium.

The title text further plays on the fact that the amp's levels are on an arbitrary scale. Many products are sold at a certain price per unit weight, volume, etc. (e.g., \$2.99/lb for grapes). Nigel calculates that the \$2000 cost for going up to 12 would equal to $\$2000 / 12$, or less than \$200 per unit of something, but he is unable to articulate what that "something" is, confirming the third panel observation of the normal engineer. Also, he already has an amplifier that goes up to eleven, so the one additional unit would cost him \$2,000 unless he sells the old amplifier. However, he decides that it's a good deal anyway, and it looks like the smart engineer has made a sale.

#671: Stephen and Me

December 04, 2009



Hey, let go! We were all thinking it! Someone had to speak truth to power!

Explanation

This is a reference to the 1989 documentary *Roger & Me*, in which director Michael Moore attempted to confront General Motors CEO Roger E. Smith over the company's closure of factories in his home town of Flint, Michigan. Moore uses the documentary to demonstrate his belief that the factory closures had a crippling effect on the local economy, and his objective is to ask the CEO pointedly about GM's disregard for the lives affected by their business decisions.

In this strip, Beret Guy mirrors Moore's determination to speak with the CEO of the auto company Volvo Cars, only to reveal that his burning question is actually trivial and juvenile in nature, comparing the company name with the outer parts of the female genitals. "Stephen" is probably Steve Odell, the CEO of Volvo Cars in 2009, a subsidiary of Ford by that time, and later taken over by the Chinese company Zhejiang Geely Holding Group.

As for Beret Guy's question itself, the two words are related: Volvo is Latin for 'I roll', and is at the root of *volva*, *vulva* 'wrapper, covering'. However, the similarity that Beret Guy (or Randall) hears is likely due to American English, which strongly approximates the pronunciation of u and a in *vulva* to that of the o's in *Volvo*. Volvo was founded and is headquartered in Sweden, where the similarity would not be as striking.

#672: Suggestions

December 07, 2009



An hour later: **SUGGESTION: LICK HER NIPPLE MORE.**

Explanation

Social networking site Facebook routinely suggests reconnecting with Facebook friends whom you haven't interacted with on the website for a while. This is taken to its logical extreme in this comic when that Facebook feature repeatedly, in an increasingly voyeuristic fashion, tries to get Cueball to hook up with his occasional friend-with-benefits Susie, despite the fact that Cueball knows she's falling for him and doesn't want to lead her on.

According to the title text, Cueball and Susie do end up hooking up, even against Cueball's better judgement, as so often happens between people who're physically attracted to one another. And he apparently left the webcam on as well, because the Facebook feature is now giving suggestions on what Cueball should do to her, mid-coitus. Obviously, this is not something that Facebook, a social networking site, can do... Yet.[citation needed]

#673: The Sun

December 09, 2009



Obligatory bad guy: This operation is sheer foolishness, and it's not happening on my watch! Mainly because I can't figure out how to adjust the time.

Explanation

This comic makes fun of science fiction disaster movies, especially the 2003 film *The Core* in which a group of scientists travel through the Earth's mantle to place a series of nuclear devices in order to speed up the slowing rotation of the Earth's core and prevent a complete collapse of Earth's magnetic field. The comic is also a pun on "Daylight Saving Time", using it to mean saving the sun's light rather than its usual meaning of the semi-annual shift in clocks to "save" daylight for a more useful part of the day.

This comic presents the next film from the makers of *The Core*. In this case an astronomer, Ponytail, discovers that the Sun's fusion is failing. The two Cueball-like guys behind her are not impressed; one is disbelieving and the other is not interested ("whatever"). But then Ponytail rallies them by pointing out the impending doom for Earth and they call NASA. A group of astronauts at NASA takes the call and the leader (another Cueball-like guy) describes what could happen in trailer-like fashion:

- The earth bathed in eternal darkness?
- A night without a dawn? Not on my watch!

Then he tells his team of astronauts - a fourth Cueball-like guy, Megan and another Ponytail - to "saddle up", and the comic finishes with the poster (a copy of the one for *The Core* with the Sun in place of the Earth's mantle) of this new movie called *The Sun*

(hence the title of the comic) with two taglines:

- It's Daylight Saving Time.
- Never fall back.

The movie describes a scenario in which "the sun's fusion is failing". This is in fact the exact plot of the British science fiction film *Sunshine* from 2007, released two years before this comic, which was about a group of astronauts sent on a mission to reignite a dying Sun with a battery of nuclear bombs.

The sun's energy comes from nuclear fusion reactions among the extremely hot, dense hydrogen nuclei in its core. The idea of the sun's fusion failing is rather ridiculous from a scientific perspective, because the fusion reactions are well understood and the sun has enough hydrogen to fuel it for about 5 billion more years. Even if the sun's hydrogen was getting low, it would start fusing helium and begin expanding into a red giant. This would then make the Earth uninhabitable. In other words, if the sun stopped fusing, we wouldn't have to worry about less sunlight, we would have to worry about more.

In any case, it appears to be failing and the solution is to send a team of astronauts to the sun to restart the fusion. The team leader is motivated by concern that if the sun's fusion stops, there will be no more light, and so the earth will be in perpetual darkness.

The poster in the final panel gives the movies two

taglines, both puns. Daylight saving time (DST) refers both to the policy of changing clocks and to the scenario in this movie in which it is time for the team to literally save the sun's daylight from being extinguished. "Never fall back" is an additional word play on the mnemonic used (in the States at least) to remember the direction to change clocks. The mnemonic, "spring forward, fall back" indicates that in the springtime, clocks get set ahead by an hour, while in fall the clocks are set backwards an hour. The phrase "fall back", however, can also mean to retreat from a battle.

Randall seems to believe that DST makes little sense today and he has made it clear in several comics that he is not a fan — or at least not a fan of the twice-yearly transitions between the two semi-arbitrary time standards. As DST is the main joke of the comic (and the title of the next movie), the comment from the astronaut about this not happening "on my watch" may be a pun relating to his wristwatch. He would not wish to have DST on his watch! This meaning is made clear in the title text (see below).

The comic makes fun of these disaster movies in a couple of ways. The characters in the first panel acknowledge that the scenario doesn't make sense scientifically, but are prepared to sacrifice scientific value for the plot. Also, in the second panel, the team is to be composed of NASA's "hottest astronauts", which makes fun of the fact that the characters in movies are much more attractive than average, and the fact that they will be much hotter when they reach the sun. The team leader expresses his concern

with a few buzz phrases often used in such films.

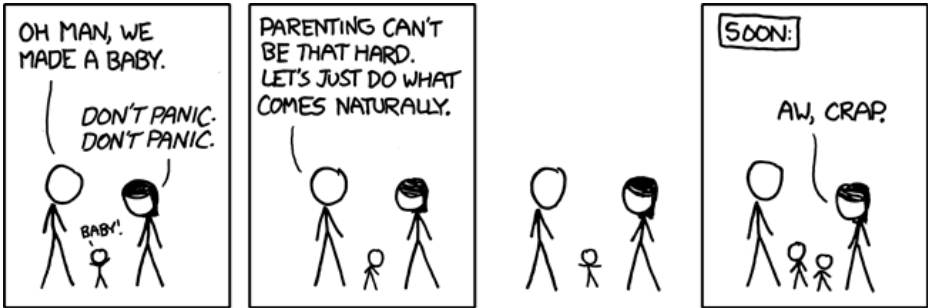
An alternative explanation, which would make sense scientifically, is that the sun had never stopped working, and Ponytail merely assumed that something was wrong with the sun when the sunrise did not occur at its normal time, but that was only because the clocks had been sent an hour ahead for DST, and not because of anything wrong with the sun, which continued working properly, oblivious to earth clocks.

The title text continues the lunacy (solacy?) of the situation with the cliché of the "obligatory bad guy" — a person in the plot who acts antagonistic, often for the flimsiest of reasons. There is also the common complaint, especially among the technologically inept, that he can't figure out how to change the time, relating back to DST, and using the phrase "on my watch" as a pun here (if you interpret "watch" in the sense of a wristwatch). The phrase "on my watch" was used in the comic itself, but it isn't clear whether it was intended as a pun. It's possible that Randall realized he missed his chance to make a great pun with that phrase, inspiring the title text.

Note that while four different Cueballs in a comic is not uncommon, it is rare that two different Ponytails are shown in one comic.

#674: Natural Parenting

December 11, 2009



On one hand, every single one of my ancestors going back billions of years has managed to figure it out. On the other hand, that's the mother of all sampling biases.

Explanation

This comic relates to the anxiety of having a first child, particularly an unplanned child, and is a play on the double meaning of the expression "do what comes naturally".

Doing what comes naturally is a euphemism for couples pairing off and forming intimate relationships, including sex. It is also advice given to new parents, advising them not to second guess themselves so much, to alleviate the stress that comes with parenting.

The couple Cueball and Megan find themselves as unexpected parents. Both parents experience anxiety over how to manage their life with the child. The new father defuses the situation and states that parenting can not be that hard and they should just do what comes naturally. Naturally the couple find themselves with a second child. This adds insult to injury as now they have two children and still no idea about how to parent. As the first child was an "accident" the birth of the child was because of instinctual urges. Therefore, assuming nothing has changed in their relationship it would be natural if they produced another child.

The baby says, "Baby!", either copying Cueball, or saying its name Pokémon-style.

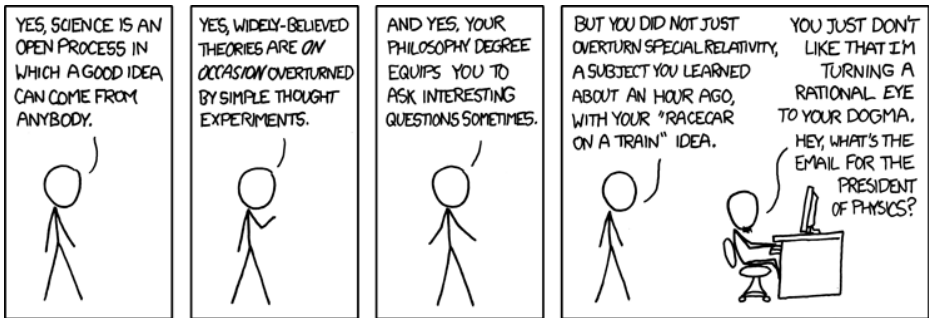
The title text claims that parenting can't be too hard because, up to the present, all of your ancestors have

produced an unbroken line of children who figured out how to raise at least one child that is able to continue this unbroken chain. Randall jokes that this is the "mother" of all sampling biases: Had anyone of one's ancestors completely failed at being parents, that person would never exist. Therefore, this sampling is heavily skewed by sampling only those that were all successful in at least one instance. It does not take into account the number of people in the past who do not have any lineage today to speak of, or the number times our ancestors failed at being parents to children we are not directly descended from.

441: Babies and 1384: Krypton also depict Cueball and Megan as people who should not be trusted with babies.

#675: Revolutionary

December 14, 2009



I mean, what's more likely -- that I have uncovered fundamental flaws in this field that no one in it has ever thought about, or that I need to read a little more? Hint: it's the one that involves less work.

Explanation

The comic contrasts brilliant revolutionary scientific thought with the simplistic arrogance of assuming one understands the current scientific theory enough to correct it, known under the Dunning-Kruger effect. The character with the goatee has a degree in philosophy, and perhaps has certain ideas of his own about how the world should fundamentally be described by physics. He has studied Einstein's theory of special relativity about an hour and thinks he has found a flaw. When confronted about this, he considers the objection as based in dogma, and remains so confident that he wants to email the "president of physics". His ignorance of the field is emphasized by thinking that the entire field of physics has a president - although certain important organizations such as the American Physical Society do have presidents.

Cueball concedes that it is possible for such a revolutionary idea to come from a relative outsider. One example is Albert Einstein's own formulation of special relativity, which came while he was working at a patent office in Switzerland, although he did already have a Ph.D in physics. A thought experiment considers some hypothesis, theory, or principle for the purpose of thinking through its consequences.

The "racecar on a train" idea alludes to thought experiments involving frames of reference, which are important in relativity. Special relativity was famously

established using some thought experiments about moving objects. However, some searchers elaborated more complicated thought experiments and claimed they had proven relativity was self-contradictory. Examples include twin paradox (both of the twins are younger than the other, until you stop assuming acceleration phases can be neglected) or ladder paradox (ladder is both smaller and larger than the garage, until you consider seriously the problems with defining simultaneity for remote locations in relativity). Apparently the philosopher complicated Einstein's train thought experiment by adding a racecar, and found contradictions which prove special relativity is inconsistent. However, most likely scenario is that the "racecar on a train" is too complicated for goatee man to find correct conclusions.

A too complex case may be impossible to prove consistent with relativity using intuition alone: complete solving involves calculation using Lorentz transformations.

The title text is posing a question about the likelihood of two scenarios (possibly to the person with the philosophy degree):

- That decades of work by numerous physicists is fundamentally incorrect, and I found the flaw immediately
- That I need to read a little more

This might be a self-referential title text as this question

could be considered a simple thought experiment. The philosopher should be able to overturn his theory using this simple thought experiment which reflects the second panel. While his theory is not widely believed the joke is that the philosopher could overturn his first thought experiment (racecar on train) with this thought experiment.

Randall hints that believing you have found fundamental flaws in a theory is much easier than doing more research on it. This is possibly a statement about using Occam's Razor in arguments, which says the simpler answer is the more likely one, which is commonly brought up in philosophy. Usually, when someone with little understanding of the subject thinks that they have found a flaw, it takes only a little bit more reading to discover that the flaw is in fact completely explained already.

#676: Abstraction

December 16, 2009

AN x64 PROCESSOR IS SCREAMING ALONG AT BILLIONS OF CYCLES PER SECOND TO RUN THE XNU KERNEL, WHICH IS FRANTICALLY WORKING THROUGH ALL THE POSIX-SPECIFIED ABSTRACTION TO CREATE THE DARWIN SYSTEM UNDERLYING OS X, WHICH IN TURN IS STRAINING ITSELF TO RUN FIREFOX AND ITS GECKO RENDERER, WHICH CREATES A FLASH OBJECT WHICH RENDERS DOZENS OF VIDEO FRAMES EVERY SECOND

BECAUSE I WANTED TO SEE A CAT JUMP INTO A BOX AND FALL OVER.



I AM A GOD.

If I'm such a god, why isn't Maru *my* cat?

Explanation

The comics points out the large number of levels of abstraction working together at any given time in today's computers.

Programs on current computers do not run "directly on hardware". Instead, the hardware (in this case, a processor of the x86-64 architecture) is controlled by the operating system kernel (in this specific case, XNU is the kernel used in Apple-branded devices). Many operating systems offer a standardized interface called POSIX, which wraps the services offered by the different operating systems so that applications do not need to cope with the differences between the operating systems. Darwin is the name of the core set of components on which the Apple's OS X operating system runs. And using this operating system, the user runs the Firefox web browser. However, the browser itself contains further abstraction layers: Gecko is the engine handling the display of web pages on the screen, but in this case, it only allows a separate software, Adobe Flash Player, to render a video requested by the user.

And all of this work is, in this case, done only because the user wanted to watch a funny cat Flash video on the Internet; which makes the user feel like he is a god.

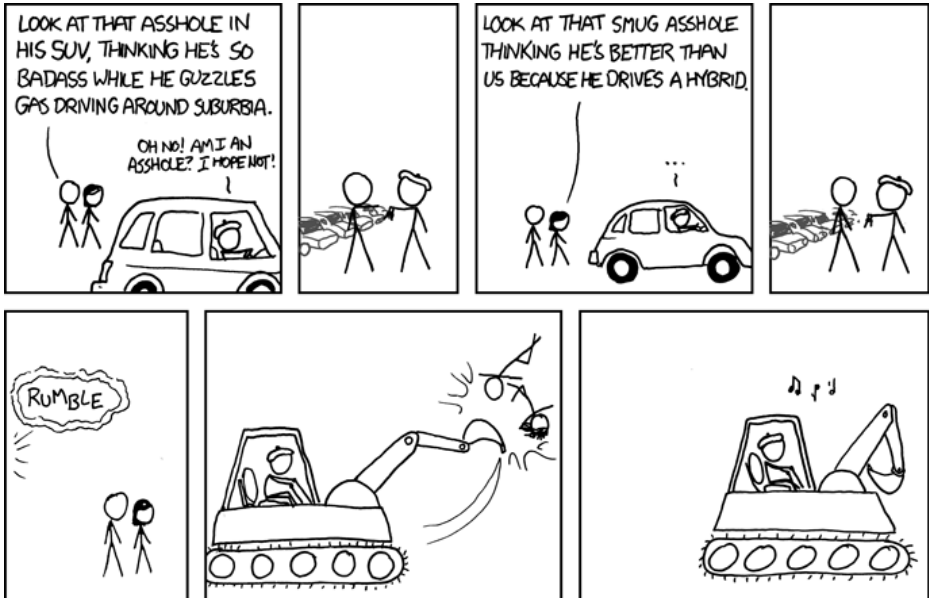
The title text refers to Maru the cat, a cat who became very popular on YouTube for, among other things, jumping into a box. Cueball questions his god-like

capabilities by wondering why can't he own Maru.

Flash was an early way to make fluid media (such as games and animations) online that didn't require transmitting much data in a time where internet speeds averaged about 300KB/s. One of its uses was for video playing in a time where many browsers did not natively support playing media. It is now superseded by HTML5 technologies and discontinued at the very beginning of 2021.

#677: Asshole

December 18, 2009



Explanation

SUVs are large personal vehicles with big engines and a huge amount of cargo space, and are notorious gas-guzzlers and therefore emblematic of pollution caused by cars. Stereotypically, SUV owners drive them because they're compensating for failures in other parts of their lives, and as an example of conspicuous consumption. Upon hearing Cueball call him an asshole for driving an SUV, Beret Guy, not wanting to appear to be such, trades his SUV in at the dealership for a hybrid subcompact.

Hybrid cars are vehicles that are powered by both gasoline and electrical motors, allowing them to consume less fuel and therefore pollute less. But stereotypically, people drive them so that they can feel superior to others about having reduced their emissions, and that's exactly what Megan says, this time, when Beret Guy happens to drive past them again.

Quite annoyed now, Beret Guy trades in his car again, this time to get an excavator (a large construction vehicle) and smack them with it. After doing this, he actually does appear quite smug and pleased with himself.

In the title text we hear some crashing sounds and then we hear a report by an eyewitness to a police officer. Beret Guy apparently used the excavator to smash into a bakery and steal scones, one of Beret Guy's beloved bakery products - see 452: Mission and the title text of

1030: Keyed.

See also 434: xkcd Goes to the Airport where Beret Guy's obsession with bakeries was first mentioned.

#678: Researcher Translation

December 21, 2009

IF A RESEARCHER SAYS A COOL
NEW TECHNOLOGY SHOULD BE
AVAILABLE TO CONSUMERS IN...

WHAT THEY MEAN IS...

THE FOURTH QUARTER OF NEXT YEAR	THE PROJECT WILL BE CANCELED IN SIX MONTHS.
FIVE YEARS	I'VE SOLVED THE INTERESTING RESEARCH PROBLEMS. THE REST IS JUST BUSINESS, WHICH IS EASY, RIGHT?
TEN YEARS	WE HAVEN'T FINISHED INVENTING IT YET, BUT WHEN WE DO, IT'LL BE AWESOME.
25+ YEARS	IT HAS NOT BEEN CONCLUSIVELY PROVEN IMPOSSIBLE.
WE'RE NOT REALLY LOOKING AT MARKET APPLICATIONS RIGHT NOW.	I LIKE BEING THE ONLY ONE WITH A HOVERCAR.

A technology that is '20 years away' will be 20 years
away indefinitely.

Explanation

This comic suggests a translation from the statements of the researcher of a potential new technology. For example, these statements might be found in an article in a popular science magazine which highlights some cutting-edge research. It reflects the idea that researchers tend to be too optimistic about the future of their research project.

"The fourth quarter of next year": Even if a technological development seems very close to completion, it could still be canceled by some authority other than the lead researcher. This might be due to poor management, or a poor business plan, or even a poor scientific basis which the researcher is hiding or ignoring.

"Five years": The researcher has solved the interesting scientific problems, and assumes that the concept could be picked up by a business, developed to be usable outside of a research lab, designed into a prototype, have a manufacturing process, marketed, and made available to consumers, in only five years. In reality, a lot of exciting-sounding technology may not reach consumers for many years because of difficulties in the business side of things.

"Ten years": Not only does the researcher assume that the business end of things will go smoothly, they also assume that the rest of their research will go smoothly. In reality, a lot of unforeseen problems could arise during research.

"25+ years": "It has not been conclusively proven impossible" indicates that it has been proven impossible in some context. The researcher simply refuses to accept the impossibility until the proof is conclusive.

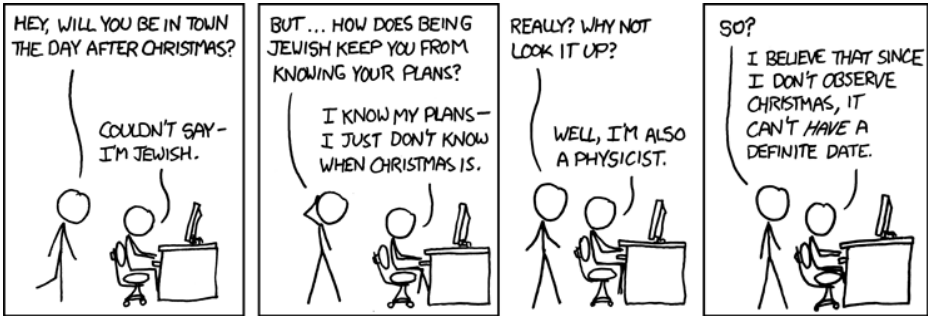
"We're not really looking at market applications right now.": In contrast to the above chain of assumptions, in this case the researcher has a working technology but wants to keep it to themselves.

Title text: "20 years away indefinitely": Sometimes the technological or engineering challenges for a certain application seem like they could be overcome in 20 years, but in reality the challenges are very difficult. The more the challenges are studied, the harder they are found to be, although there is always hope that a few more advances will do it. An example is fusion power, which has been conceptualized since at least 1946 as a potentially unlimited source of clean energy, but remained an elusive achievement despite projects such as the National Ignition Facility and ITER. The first commercial plant is still indefinitely 20 years away.

A similar table was shown in 1497: New Products.

#679: Christmas Plans

December 23, 2009



Physicists who want to protect traditional Christmas realize that the only way to keep from changing Christmas is not to observe it.

Explanation

This comic centers around a joke about Quantum superposition in physics - if you don't observe something, it has all possible states, not a specific one. It is a double-entendre with the word observe meaning both "look at" (physics sense) and "celebrate" (a holiday). One of the most famous examples on this is the Schrödinger's cat paradox.

In this comic, a Jewish physicist does not know when Christmas is. Being a physicist, he believes that since he doesn't observe Christmas, it therefore has no definite date.

Adding to the joke, the physicist's observation is actually valid for certain other holidays (such as Easter) that don't have a definite (i.e. annual) date. Because Easter's date seemingly bounces around at random, it could be said to exist in a superposition of all possible Easter dates, and as he doesn't observe (celebrate) Easter, the physicist would be unlikely to check which date it falls this year. Thus, he would be unsure of when the holiday is celebrated.

The title text refers to another principle in physics where the act of measuring something must also change it in some way. If one drops a thermometer into a mug of water, energy spent (or released) when heating (or cooling) the mercury in the thermometer changes the temperature of the water in the mug by a small amount. The only way not to interfere with the temperature of

the water in the mug is not to measure it.

#680: December 25th

December 25, 2009



If you're turning **27** and were born in the Northeast, maybe you were conceived in the April blizzard of **1982**. Imagine: snowed in, candles, massage oil, your mom sporting nothing but her early **80's** haircut and a smile ... aren't you glad you read the title-text?

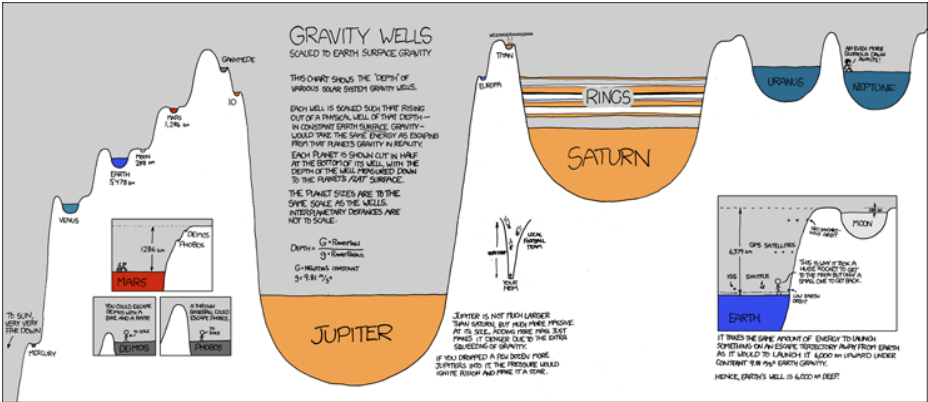
Explanation

On Christmas Day, most kids whose families celebrate the holiday get Christmas presents. And kids who were actually born on the 25th may feel a little put off because they don't get a special day all to themselves like their siblings and friends do. A lot of families alleviate this by celebrating the child's birthday on a day other than the 25th, so the kid will still get their own party. Unfortunately, the child may not get double presents, but may instead end up getting one gift per gift-giver as both a Christmas gift and a birthday gift.

In the title text, Randall provides a "lovely" image for the people turning 27 on this date (Christmas Day, 2009) that would surely have them reaching for the brain bleach. He describes the prospective 27-year old reader's mother naked, immediately before the sexual encounter in which the reader was conceived. Such a sexual encounter may have been expedited by the (compulsory) seclusion enforced by the blizzard that ravaged New York and New England (where Randall is from) in April 1982 - the blizzard left some people trapped in the houses by snow-drifts and blocked transport for days on end. Given the severity, unexpected nature and location of the blizzard, Randall might well have heard about it as a child, as he was born a mere two years after the event.

#681: Gravity Wells

December 28, 2009



This doesn't take into account the energy imparted by orbital motion (or gravity assists or the Oberth effect), all of which can make it easier to reach outer planets.

Explanation

The comic shows the gravitational potential (energy transferred per unit mass due to gravity) for the positions of each planet in the solar system — including some moons and Saturn's rings. An object traveling along an upward slope loses energy, while an object traveling along a downward slope gains energy. Escaping a planet or moon's orbit requires enough energy (e.g. by walking, jumping, or rocket) to reach the top of either peak that defines the edge of the well. The peak to the left indicates the minimum energy required to exit orbit. The peak to the right indicates the maximum energy required to exit orbit. In order to exit orbit with the minimum amount of energy, you would have to travel towards the center of the solar system; to exit orbit with the maximum amount of energy, you would have to travel away from the center of the solar system (the Sun). In reality, the strength of gravity decreases with distance from the planet. However, a comparison of energy expended to escape the gravitational pull allows for a simpler comparison between the objects.

The height of the graph is scaled to kilometers via the gravitational potential an object has at the given height assuming at a constant acceleration due to Earth's surface gravity. The Sun's gravity well is not shown in its entirety, but is just indicated on the far left as "Very very far down". Had it been shown in its full extent it would have made the rest of the drawing so small in comparison that it would have been unreadable. As the gravitational

potential increases with distance from the sun, the graph has a general upward slope. To rise out of each well on the diagram, and therefore escape the planet's gravity, it would require the same energy required to rise out of a physical well of that depth at Earth's surface gravity.

The length of each gravity well is scaled to the diameter of the planet and the spacing between the planets is not to scale with distance from the sun. This is necessary to make the graph readable. Because the distances between the planets are condensed, the gravitational potential - from the gravity pulling toward the sun - accumulates quicker. This is the reason for the large peaks between the planets. The moons shown in the chart are at the appropriate distance from their respective planets' gravity wells for their orbits. Each planet is shown cut in half at the bottom of its well, with the depth of the well measured down to the planet's flat surface.

- Mercury — no facts listed
- Venus — no facts listed
- Earth and Moon: The listed depth of the gravity well at Earth was originally listed at 5478 km rather than the correct value of 6379 km seen in the cutout. Randall has since corrected it. The Moon's is 288 km.
- Mars: The listed depth of the gravity well of Mars is 1286 km.
- Jupiter: Jupiter is so massive and dense that it is one thirteenth the mass of a small Brown dwarf which is the smallest kind of star. Saturn, while similar in size, is

composed of much lighter gas material. Hence Saturn's mass and therefore its gravitational pull are much smaller. If a few dozen times the mass of gasses contained in Jupiter had condensed in that location, the gravitational pull would cause the pressure and temperature to increase to a level that is sufficient to ignite nuclear fusion. Had that happened during the creation of our solar system, we would have two Suns and our solar system would be a Binary system. Jupiter has 67 moons of which 3 are shown;

Ganymede — moon of Jupiter, no facts given

Io — moon of Jupiter, no facts given

Europa — moon of Jupiter, no facts given

- Saturn: The diagram shows the position of the rings of Saturn in Saturn's gravity well. Saturn's rings start fairly near the planet and extend out quite far, therefore multiple stripes are shown in the figure. The rings are also shown in multiple colors and roughly match the observed colors from photos take by the Cassini spacecraft expedition as it passed Saturn. All of the colors of the planets and moons represent the predominant color of that object as observed from earth. Saturn has 62 moons of which one is shown;

Titan, a moon of Saturn. The figures on Titan are sirens, a reference to Kurt Vonnegut's *The Sirens of Titan*.

- Uranus: Notably absent is any "your-anus" jokes.
- Neptune: Megan's quote is a paraphrase of Carl Sagan's

quote, "...but from a planet orbiting a star in a distant globular cluster, a still more glorious dawn awaits, not a sun-rise, but a galaxy rise." Video [here](#)

The following items are listed from top to bottom and left to right.

- Mars moons: The Mars cutout shows the Mars moon system, including the moons Deimos and Phobos. The depth of the Mars gravity well is listed at 1286 km.

Deimos: The gravity on Deimos, a moon of Mars, is so weak that a bike jump would be sufficient to escape its gravity.

Phobos: The gravity on Phobos, a moon of Mars, is so weak that you could launch a baseball into space simply by throwing it.

- Your mom and a local football team: The sketch next to Jupiter is playing on the classic "Yo Mama" joke. It combines "Yo Mama is so fat" and "Yo Mama is so horny". The sketch implies that she has a huge gravitational pull because she is very fat, and has sex with an entire football team by demonstrating a football team falling into her very deep gravity well. A "Yo Mama" joke also appears in comic 89: Gravitational Mass.
- Earth's Moon: The cut out shows the significant difference in strength between the gravity well of the Earth and the Moon. Cueball comments that the Apollo Lunar Module was very small and the Saturn V rocket was very large because escaping the Earth's

gravity well takes much more energy than escaping the Moon's. The cut out also shows objects like the International Space Station, the space shuttle, GPS satellites and geo-stationary satellites at their respective positions within Earth's gravity well. The depth of Earth's gravity well is listed correctly at 6 379 km (note the difference from the non-cutout number). The depth of the Moon's gravity well is listed at 288 km.

How to calculate gravity wells[edit]

The text near the bottom of Jupiter's gravity well explains that the depth of the well is mass-of-planet over radius-of-planet with Newton's constant and 9.81 m/s^2 as constants, where 9.81 m/s^2 is the acceleration of a free falling body at Earth's gravity.

The calculation for a gravity well is:

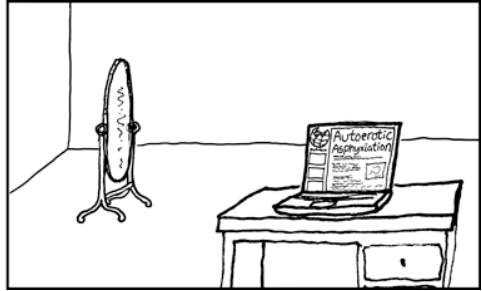
The title text indicates that the planets motion can affect the amount of energy for escape velocity. It is possible to change speed by using the planets orbital speed and gravity. This is known as a performing a slingshot or a gravity assist, and is done to gain speed or to brake when needed. The use of rocket engines are more effective when used at a high speed slingshot maneuver, which is known as the Oberth effect, where most energy is going into moving the rocket as opposed to moving the exhaust — conserving the maximum useful energy. On earth the same principle is used when launching rockets. Rockets are always launched in an eastward direction to make maximum use of the rotational energy of the earth. Launching rockets in a westward direction would require significant additional energy. Because of this most artificial satellites are flying east around the globe.

The size of the gravity-well as described in this comic is not accounting for these factors. Therefore, leaving the solar system (or any of the gravity wells of the planets) could require less energy than described by the graph, assuming that the launch and slingshots are properly designed and executed.

The following table was adapted from the table in Escape velocity, using $h = V_e^2 / 2g$:

#682: Force

December 30, 2009



Force-choking the chicken.

Explanation

This comic features Darth Vader, the main antagonist from the original Star Wars trilogy.

Autoerotic asphyxiation is a sexual practice in which lack of oxygen is induced to enhance sexual stimulus. The technique is considered extremely dangerous, especially without supervision, as loss of consciousness can result in continued strangling which can quickly be fatal.

In the films, Vader possesses the ability to restrict the airway of anyone without having to touch them, using only the so-called "force". This practice has therefore been called force-choking. The comic assumes that Vader used this technique against himself, with the help of a mirror, in order to become sexually aroused.

Lord Vader has apparently force-choked himself to the point of unconsciousness (or possibly even death) and is being transported from his house on a stretcher by two Emergency Medical Technicians (EMTs).

The title text is a pun on the term "choking the chicken", a colloquial expression referring to male masturbation. "Force-choking the chicken" might mean a technique of self-gratification by use of the "force" without having to apply one's hands.

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